Technical manual

ThorGuard
Intruder Alarm System

91001002

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92001002	Revised version of the technical manual ref. No. 91001001 for the ThorGuard Intruder Alarm System.	030827

ThorGuard Intruder Alarm System

Technical manual

Introduction

This manual provides an overview of the ThorGuard Intruder Alarm System, controlled by the ThorGuard Central Unit.

The manual includes a description of the various components that can be used with the system including information about their installation and connection. Needed information regarding transfer of firmware files for the ThorGuard Central Unit can also be found in this manual.

Related manuals

The operation of the system is described in the users manual for the ThorGuard Intruder Alarm System, Ref. No. 92002701 (English version – not yet available).

Programming of the system is described in the users manual for the ThorGuard Configuration System program, Ref. No. 92003301 (English version – not yet available)

Date

The date of publication is 030827.

Reference number

The reference number of this manual is: 91001002

Compliance

If the installation instructions supplied in this manual are followed, the ThorGuard Intruder Alarm System complies with the following standards:

EMC immunity	EN 50130-4	Alarm systems Part 4: Electromagnetic compatibility. Product family standard: Immunity requirements for components of fire, intruder and social alarm systems.
EMC emission	EN 50082-1	Generic Immunity Standard Part 1: Residential, commercial and light industry.
	EN50082-2	Generic Immunity Standard Part 2: Industrial environment, heavy industry.
	EN 50081-1	Electromagnetic compatibility - Generic emission standard Part 1: Residential, commercial and light industry.
Safety	EN 60950	Safety of information technology equipment, including electrical business equipment.

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Warnings and cautions

This section contains all warnings and cautions contained in the various chapters of this manual. These warning and cautions should be observed when installing and servicing the product:

Warning during installation

Page 3-6	✖	***The EN 60-950 Low Voltage Directive requires that permanently connected equipment should be installed with a readily accessible disconnection device.***

Cautions during installation

Page 3-8	!	*Always use batteries that are identical and ensure that they are fully charged before installation.*
Page 3-10	!	*Please note the IPI TCP/IP interface can only be used in connection with ThorGuard CPU-board version 2.0. See this section, page 3-11.*
Page 3-18	!	*Please note that the auxiliary power supply must have the same output voltage as the built-in power supply of the ThorGuard central Unit. This is 15 V DC for the 12 V version and 29 V DC for the 24V version.*
Page 3-20	!	*Please note that if you change the default setting of the jumpers J1C (OFF) and JD1 (ON) for the 24 V version to J1C (ON) and JD1 (OFF), a voltage of 28.3 V DC will be supplied to the "12 V" terminals.*
Page 3-20	!	*Please note that J1F and J1G must always both be ON or both be OFF.*
Page 3-22	!	*Please note that the jumpers J1A and J1B must not both be ON at the same time. If J1A is OFF, J1B must be ON or vice versa.*
Page 3-22	!	*Please note that if you change the default setting of the jumpers J1C (OFF) and JD1 (ON) for the 24 V version to J1C (ON) and JD1 (OFF), a voltage of 28.3 V DC will be supplied to the "12 V" terminals.*
Page 3-24	!	*Please note that if you change the default setting of the jumpers J1C (OFF) and JD1 (ON) for the 24 V version to J1C (ON) and JD1 (OFF), a voltage of 28.3 V DC will be supplied to the "12 V" terminals*
Page 3-35	!	*The cable length of a star-connected RKP or RKP-E must not exceed 0.3 m*

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Table of contents

1

This manual

Introduction

This manual is designed to provide the information needed for installing a ThorGuard Intruder Alarm System and transfer of firmware files to the Central Unit.

The manual is divided into chapters to fulfil the needs for information for the following categories of users:

- The system designer
- The installer
- The programmer

This chapter

The content of this chapter is outlined in the table below.

Section	*Topic*	*Page*
How to use this manual	A general introduction to the conventions and the organization of this manual.	1-2

1.1 How to use this manual

This section contains a short description of the typographical conventions used in this manual and some guidelines for reading the manual.

1.1.1 Typographical conventions

Introduction

Typographical conventions are used throughout this manual to help you find the information you are looking for.

Sections and labels

Each section is divided into subsections that each deals with a distinct topic – e.g. this subsection, Typographical conventions. A subsection contains a number of blocks, usually labelled either in the margin or preceded by an unnumbered heading. You can use these labels and headings to glance quickly through the section. You can also ignore the labels and headings, reading only the text of the section.

Warnings Cautions and hints

Warnings, cautions and hints are items to which you should pay particular attention. They look like this:

✖ ***Warnings indicate procedures, precautions, etc., to follow to prevent injuries or accidents.***

! *Notes of caution tell you to pay special attention to certain subjects.*

☛ Hints are suggestions that will help you get along with a task.

Procedures

A procedure that tells you how to perform a task looks like this:

Step	*What to do ...*
1	Insert a 2.5 mm Allen key in the locking screw in the top of the RKP.
2	Turn the key counterclockwise 8 to 10 turns to release the locking screw completely. The locking screw cannot be removed; it is retained in the cover.
3	Push the front cover and the case in the directions shown by the arrows until they are disengaged.
…	… … …

Lists

In a list that summarizes a number of facts, each item is preceded by a ● like this:

- Basic knowledge about the ThorGuard Intruder Alarm System and associated components.
- Procedures for installing hardware and transferring firmware files.
- Reference information about the ThorGuard Intruder Alarm System and associated components.

Keyboard keys

A keyboard key is represented by the name of the key in capitals like this: Press TAB to move to the next item in the dialog.

Keyboard key combinations are shown like this: Press ALT+E to display …

Buttons, labels, icons, boxes, dialogs, etc.

Switches “1” to “5” are used for setting the address. Switch “6” is used for selection of the termination while the switches “7” and “8” are used for setting the communication (normal or inverted)

1.1.2 How this manual is organized

Types of information

To make it easier to find the information that you want each chapter deals with the ThorGuard Intruder Alarm System primarily from a specific point of view. The same topic may appear in another chapter, but from different points of view. The contents of each chapter belong to one or two of the following categories.

- Basic knowledge about the ThorGuard Intruder Alarm System and associated components.
- Procedures for installing hardware and transferring firmware files.
- Reference information about the ThorGuard Intruder Alarm System and associated components.

Basic knowledge

A chapter of this category contains introductory descriptions of the intruder alarm system and associated components or descriptions of concepts used in another part of the manual.

Procedures

A chapter of this category contains instructions about how to perform typical tasks. Some basic knowledge about the ThorGuard Central Unit and the associated components may be required.

Reference

A chapter of this category contains more detailed information about the ThorGuard Intruder Alarm System and its associated components.

The chapters

This manual contains the chapters listed in the table below with content and point of view.

Chapter title	*Contents*	*Point of view*
1 This manual	An introduction to this manual (this chapter).	-
2 System description	Description of system configuration and system components.	Basic knowledge /reference
3 Installation	How to mount and interconnect the components of the ThorGuard Intruder Alarm System.	Procedure
4 Transfer of firmware files	How to connect the ThorGuard Central Unit to a PC via the Service connector and how to transfer firmware files.	Procedure/reference

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2

System description

Introduction

The information contained in this chapter is needed for the system designer and may be useful for the installer as well as the programmer.

The chapter provides an overview of a simple ThorGuard Intruder Alarm System configuration and describes the components of the system including main functions and specifications.

This chapter

The content of this chapter is outlined in the table below.

2.1 Overview

Introduction

The ThorGuard Intruder Alarm System is a modern, flexible security system suited for bank installations as well as for medium to larger sized industrial installations.

2.1.1 Primary features

The primary features of the ThorGuard Intruder Alarm System comprise:

- Programming of up to 64 zones and 250 areas.
- Handling of up to 250 users.
- 32 freely programmable user profiles.
- Freely programmable reaction types for up to 480 inputs/outputs.
- Up to 16 programmable time locks operated via Intruder Alarm Keypads.
- Easy flash memory firmware update.
- Easy upgrade of old Thor Intruder Alarm Systems using CU-30 Central Unit.
- Straightforward programming via the ThorGuard Configuration program.

2.1.2 Basic elements

The basic elements of the ThorGuard intruder Alarm System comprise:

- ThorGuard Central Unit.
- S-ART 120 Expansion Boards for additional S-ART buses (Optional).
- One or more Intruder Alarm Keypads RKP or RKP-E for daily operation.
- External Display Module EDM for display of count down time.
- TCP/IP Interface for communication via LAN/WAN (Optional).
- General purpose interface for connection of modem, PC, etc.
- RS-485 bus for communication with Intruder Alarm Keypads, etc.
- S-ART Units of various types.
- S-ART buses for communication with the S-ART Units.

An installation may include up to 120 individual (optionally 480) addressable input/output circuits (S-ART Units) and two internal inputs and eight internal outputs including a single relay output.

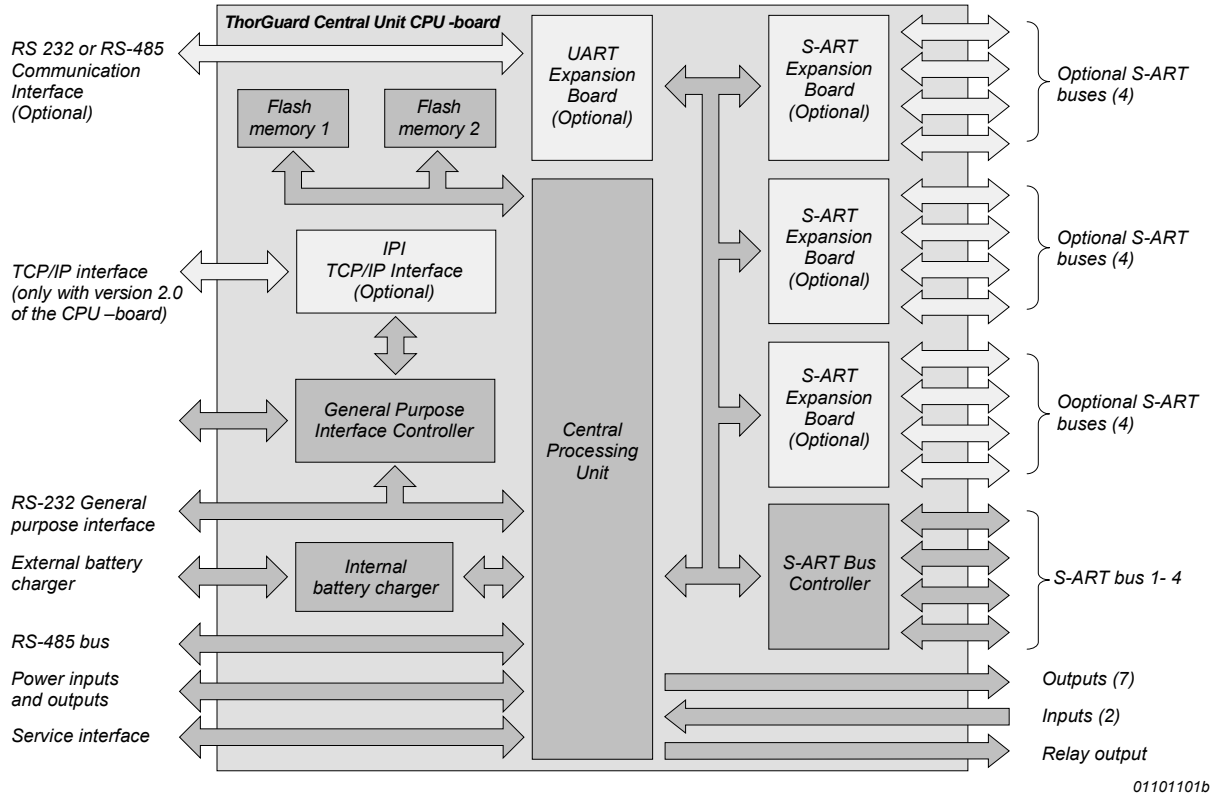
The system provides means of dividing the installation into a number of smaller areas (Up to 250) and zones (Up to 64), each of which can be operated individually by means of an Intruder Alarm Keypad, communicating with the operators (Up to 250) each associated with a one of up to 32 user profiles that are freely programmable.

☛ Please note that the IPI TCP/IP interface can only be used in connection with ThorGuard CPU-board version 2.0. See page 3-11.

2.1.3 Simplified block diagram

The simplified block diagram below shows the input and output facilities of the ThorGuard Central Unit Board.

Fig. 2.1 *Simplified block diagram of the ThorGuard Central Unit Board showing inputs and outputs including optional expansion boards and optional TCP/IP interface. The TCP/IP Interface can only be used with version 2.0 of the Central Unit Board.*



Communication interface

The UART Expansion Board (Optional) provides an additional, fast communication interface that can be either an RS-485 or an RS-232 interface.

TCP/IP interface

TCP/IP Interface is an optional interface board that can be used for interfacing the ThorGuard Central Unit to TCP/IP networks. It provides an Ethernet connection to a 10baseT LAN/WAN or a PPP connection to a LAN/WAN. Please note that the IPI TCP/IP interface can only be used in connection with ThorGuard CPU-board version 2.0. See page 3-11

General purpose interface

The General purpose interface (RS-232) can be used for connection of a modem, a PC, a printer etc.

RS-485 bus

The RS-485 bus interconnects the Intruder Alarm Keypad RKP or RKP-E and other units such as the General Purpose Interface and the External Display Module EDM. It controls the interchange of data between the units and the ThorGuard Central Unit.

Power inputs and outputs

Inputs for connection of internal power supply, auxiliary power supply for S-ART 120 Expansion Boards and output for connection of back-up batteries

Service interface

The Service Interface is primarily used for transfer of software updates to the Central Unit, the GPI and the S-ART controller and S-ART 120 Expansion Boards.

S-ART bus 1 - 4

In its basic version, the ThorGuard Central Unit Board has four S-ART buses that each can handle 30 S-ART units.

Optional S-ART buses

S-ART 120 Expansion Boards can be added for connection of additional S-ART buses. Each expansion board has connection facilities for four S-ART buses.

Outputs

The seven internal outputs can be used for connection of for example LEDs, indicator lamps, acoustical warning devices, etc.

Inputs

The two internal inputs can be used for connection of for example tamper contacts in externally connected devices such as sirens.

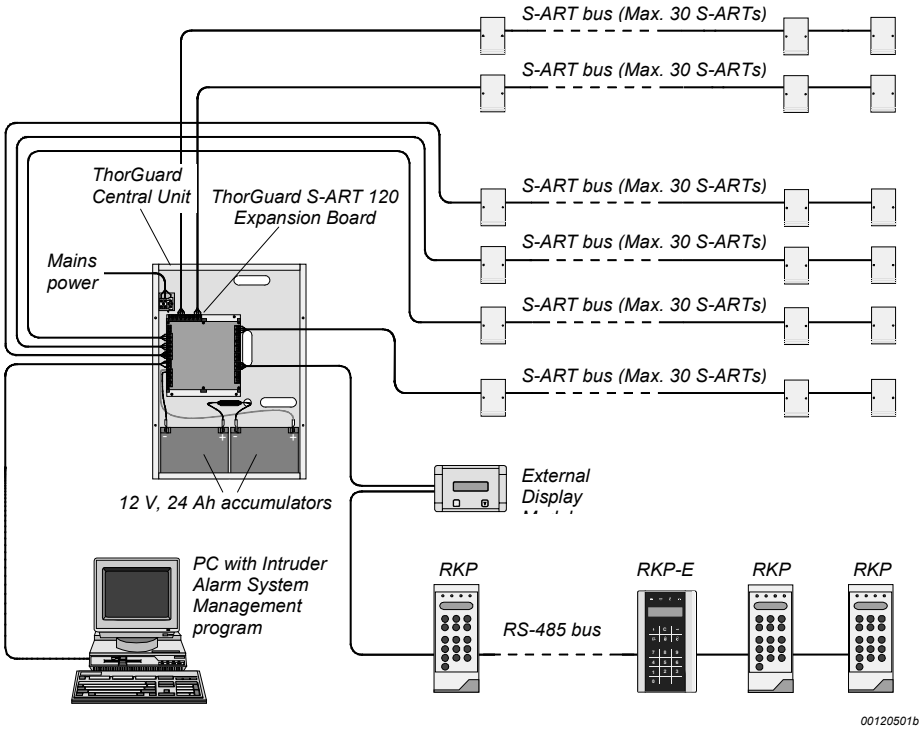
Relay output

The relay output can be used for operation of power consuming devices such as a siren. It has one change-over contact.

2.1.4 Example of a ThorGuard Intruder Alarm System

This section describes briefly a ThorGuard Intruder Alarm System. The section does not include descriptions of the individual components of the systems. These can be found in Section 2.2.

Fig. 2.2 *Example of a simple ThorGuard Intruder Alarm System with six S-ART buses operated from four Intruder Alarm Keypads and managed via a PC connected to the ThorGuard Central Unit via the on-board General Purpose Interface.*



The figure above shows an example of a ThorGuard Intruder Alarm System with six S-ART buses and three RKP and one RKP-E managed via a PC connected to the ThorGuard Central Unit via the on-board General Purpose Interface. The PC may also be connected to the ThorGuard Central Unit via the IPI TCP/IP Interface either directly or via an Ethernet connection.

2.2 System components

Introduction

This section describes the components that can be used for the ThorGuard Intruder Alarm System with the exception of the PC and modems and interfaces that can be connected via the RS-485 bus.

The description of the components comprises the information needed to understand its operation and use. Where appropriate, illustrations and specifications are supplied as well.

The description comprises the following components:

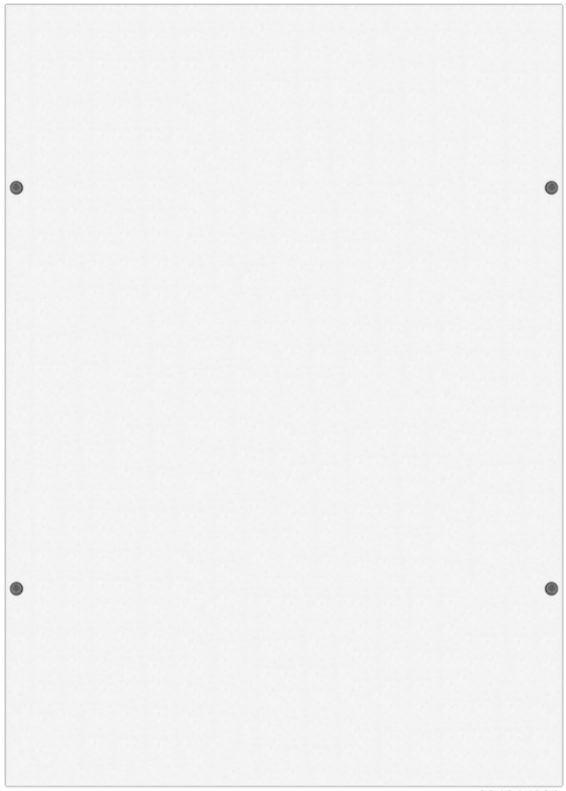
- ThorGuard Central Unit
- ThorGuard S-ART 120 Expansion Board
- ThorGuard UART Expansion Board
- Intruder Alarm Keypad RKP
- Intruder Alarm Keypad RKP-E
- External Display Module EDM
- TCP/IP interface IPI
- RS-485 bus
- S-ART buses
- S-ART Units S-106, S-107, S-108, S-112, S-120, S-121, S-122. S-123, and S-130. Although discontinued, S-ART Units S-100, S-101, S-102 and S-103 are included as well.

Supply voltage

The RKP, RKP-E, EDM and S-ART Units manufactured by HI SEC International are in general designed to operate on supply voltages from 10 to 30 V DC and will operate satisfactorily within this range.
However, when designing an actual system, nominal operating voltages of either 14.3 V (12 V system) or 28.3 V (24 V system) are used.
Specifications in the following sections, relating to the operating voltage, are in general provided for these voltages only.

2.2.1 ThorGuard Central Unit

Description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The ThorGuard Central Unit is powered from 230 V AC and is available in two versions providing nominal DC supply voltages of either 14.3 V (12 V version) or 28.3 V (24 V version) for units connected to S-ART buses and RS-485 bus. Both versions exist with three versions (1.0, 1.1, and 2.0) of the CPU-board differing mainly with respect to the power supply facilities.
See specifications on the following page and Section 3.2.

The 12V DC version requires a single backup battery while the 24 V DC version requires two backup batteries.
For version 1.0 and 2.0, charging is temperature compensated to ensure long life of the batteries. Version 1.1 has no internal charging circuit. Charging current must therefore be supplied from an external charger.

The ThorGuard Central Unit is shown above in scale 1:5.

In its basic version, the ThorGuard Central Unit can manage up to 120 S-ART addresses. The number of S-ART addresses can be expanded by means of up to three S-ART 120 Expansion Boards – each controlling 120 S-ART addresses – giving control of up to 480 S-ART addresses.
In addition to this, the ThorGuard Central Unit has two alarm inputs for connection of for example tamper or alarm switches with normally closed (NC) contacts.

The ThorGuard Central Unit has seven alarm outputs for connection of LEDs, indicator lamps, acoustical warning devices, etc. and a relay output with a single set change-over contacts that can be used for connection of for example a siren.

Up to 29 addressable units such as Intruder Alarm Keypads, External Display Modules, or Access Control Terminals as well as a PC for management of the system can be connected to the ThorGuard Central Unit via an RS-485 bus.

An on-board communication unit (GPI COM) with an RS-232 serial interface enables communication with a PC, a modem or a printer.

Installation

General instructions for mounting the ThorGuard Central Unit are provided in Section 3.2.

Electrical specifications

Parameter	*Value or description*
Operating voltage:	230 V AC, ±15%.
Current consumption:	12 V version: Max. 0.2 A at 230 V AC. 24 V version: Max. 0.17 A at 230 V AC.
Power inputs:	Power supply inputs on the CPU-board for connection of the built-in power supply (Vsw) and additional power (Vaux).
Vsw input:	Used for all onboard supply including all connectors. Input voltage: 15 V DC (12 V version) or 29 V DC (24 V version). Max. input current (Version 2.0): 6 A at 15 V and 4 A at 29 V. Max. input current (Version 1.0): 4 A at 15 V and 29 V. Max. input current (Version 1.1): 2.2 A at 15 V and 29 V.
Vaux input:	Used for supply of additional power (Vdd) in version 1.0 or supply of optional S-ART 120 Expansion Boards for version 2.0. Input voltage: 15 V DC (12 V version) or 29 V DC (24 V version). Max input current (Version 2.0): 4 A at 15 V and 29 V. Max input current (Version 1.0): 2 A (3 A_{peak}) at 15 V and 29 V. Please note that for version 1.1, the Vaux input is not used
Power outputs:	Power supply outputs on the CPU-board for supply of charging current and operating power (12 V and Vdd) for alarm outputs, relay output, S-ART Units, Intruder Alarm Keypads, etc.
Batt. Charge output:	Charging voltage (12 V version): 13.8 V DC. Charging voltage (24 V version): 27.6 V DC. Charging current: Selectable to either ~1200 mA or ~1800 mA. The charging circuit applies pulse charging. Charging voltage and current can therefore not be directly measured.
12V outputs:	Output voltage (12 V version): 14.3 V DC (Default jumper setting). Output voltage (24 V version): 14.4 V DC (Default jumper setting).
Vdd outputs:	Output voltage (12 V version): ~14.3 V DC. Output voltage (24 V version): ~28.3 V DC.
Output current (12 V outputs): (12 V and 24 V versions)	For all versions (1.0, 1.1 and 2.0), the maximum total current that can be drawn from all "12V" outputs is 500 mA (*See Note*). Information about fuses is available on pages 3-21 (Version 2.0), 3-23 (Version 1.0), and 3-25 (Version 1.1).
Output current (Vdd outputs): (12 V version)	For version 2.0, the maximum total current that can drawn from all "Vdd" outputs is 4600 mA at 1200 mA charging current and 4000 mA at 1800 mA charging current. (*See Note*). Information about fuses is available on page 3-21 (Version 2.0). For version 1.0 and 1.1, the maximum total current that can drawn from all "Vdd" outputs is 2000 mA. (*See Note*). Information about fuses is available on pages 3-23 (Version 1.0), and 3-25 (Version 1.1).
Output current (Vdd outputs): (24 V version)	For version 2.0, the maximum total current that can drawn from all "Vdd" outputs is 2600 mA at 1200 mA charging current and 2000 mA at 1800 mA charging current. (*See Note*). Information about fuses is available on page 3-21 (Version 2.0). For version 1.0 and 1.1, the maximum total current that can drawn from all "Vdd" outputs is 2000 mA. (*See Note*). Information about fuses is available on pages 3-23 (Version 1.0), and 3-25 (Version 1.1).
Note:	For the various versions the total current consumption for units connected to the "12 V" and "Vdd" terminals must no exceed: Version 2.0 (12 V): 4600 mA at 1200 mA charging current. 4000 mA at 1800 mA charging current. Version 2.0 (24 V): 2600 mA at 1200 mA charging current. 2000 mA at 1800 mA charging current. Version 1.0 and 1.1 (12 and 24V); 2000 mA

Continued ...

Parameter	Value or description
S-ART buses:	In standard version four S-ART buses each controlling 30 S-ART addresses. Expandable up to 16 buses with 480 S-ART addresses using S-ART 120 Expansion Boards. See also Section 2.2.2.
RS-485 bus:	Connection of one RS-485 bus accommodating thirty individually addressable units such as Intruder Alarm Keypads. See Section 3.2.6.
RS-232 port:	For connection of modem. See also Section 3.2.8.
Baud rate:	9600 Baud.
Flow control:	XON/XOFF.
Data bits:	8.
Parity:	Even.
Stop bits:	1.
Alarm inputs:	Two inputs for connection of tamper or alarm switches with normally closed (NC) contacts (See also Section 3.2.5).
Alarm outputs:	Seven outputs for connection of LEDs, indicator lamps, acoustical warning devices, etc. (See also Section 3.2.5).
Relay output:	Relay output with a single set change-over contacts for connection of for example a siren (See also Section 3.2.5).
	Relay switching voltage: 30 V DC or AC. Relay contact current: 2 A DC or AC. Relay switching power: 60 W or 120 VA.

Other specifications

Parameter		Value or description
Environmental:		
	Temperature range:	-5 °C to +50 °C.
	Humidity range:	0 - 96% RH, non-condensing.
Dimensions:	Height:	525 mm.
	Width:	375 mm.
	Depth:	145 mm including feet.
	Weight:	10.5 kg excluding battery.

2.2.2 ThorGuard S-ART 120 Expansion Board

Description

The S-ART 120 Expansion Board has four S-ART buses that handle 30 S-ART addresses each.

Three S-ART 120 Expansion Boards can be installed giving 360 extra addresses in addition to the 120 addresses available as standard.

The S-ART 120 Expansion Board is a plug-in unit that is mounted in the guide rails of the expansion slots below the CPU-board of the ThorGuard Central Unit.

The S-ART 120 Expansion Board is shown to the right in scale 1:2.

Power (Vdd) for the S-ART buses on the S-ART 120 Expansion Board may be supplied from the ThorGuard CPU-board (version 1.0 and 1.1) or from an external source (version 2.0). The ways in which this power can be supplied depend on the version of the ThorGuard CPU-board. See pages 3-11 and 3-17.

The maximum current that can be drawn from the “Vdd” terminals of each of the S-ART buses is limited by a fuse to 500 mA.

Mounting

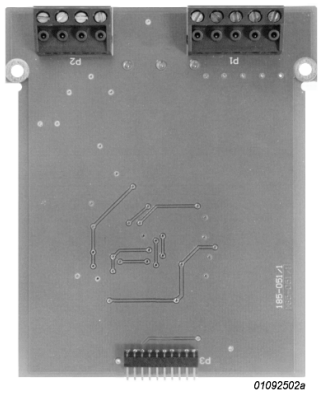
The mounting of the S-ART 120 Expansion Board is described in Section 3.6.

Specifications

Parameter	*Value or description*
No. of S-ART buses:	4.
No. of addresses per bus:	30.
Current consumption:	50 mA at 12 V, 40 mA at 24 V.
Environmental:	
Temperature range:	-5 °C to +60 °C.
Humidity range:	0 - 96% RH, non-condensing.
Dimensions: Height:	100 mm.
Width:	84 mm.
Depth:	23 mm.
Weight:	60 g.
Mounting accessories included:	M3 securing screw.

2.2.3 ThorGuard UART Expansion Board

Description



The UART Expansion Board is a plug-in unit that is mounted in the guide rails of the expansion slots below the CPU-board of the ThorGuard Central Unit.

☛ Please note that the UART Expansion Board is not yet available.

The UART Expansion Board (*U*niversal synchronous *R*eceiver/*T*ransmitter) is equipped with an RS-485 interface and an RS-232 interface that can be used one at a time.
The interfaces are linked directly to the Central Processing Unit of the ThorGuard Central Unit Board thereby providing a faster transmission rate than that achieved via the RS-232 General Purpose Interface.
The UART Expansion Board is powered from the internal 5 V DC supply on the ThorGuard Central Unit Board. Thus no auxiliary supply is required.

Mounting

The mounting and connection of the UART Expansion Board is not yet described in this manual.

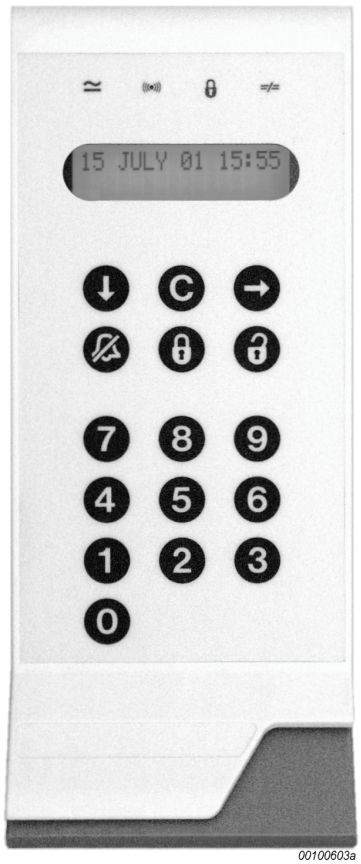
Specifications

Parameter	*Value or description*
RS-485 interface:	Half duplex.
RS-232 interface:	Communication parameters are programmable.
Default parameters:	
Baud rate:	9600 Baud.
Flow control:	XON/XOFF.
Data bits:	8.
Parity:	Even.
Stop bits:	1.
Current consumption:	10 mA at 5 V DC.
Environmental:	
Temperature range:	-5 °C to +60 °C.
Humidity range:	0 - 96% RH, non-condensing.
Dimensions: Height:	100 mm.
Width:	84 mm.
Depth:	15 mm.
Weight:	40 g.
Mounting accessories included:	M3 securing screw.

2.2.4 Intruder Alarm Keypad RKP

Description

The RKP – Intruder Alarm Keypad – is designed for in-door wall mounting.
It has a keypad with six function keys and ten digit keys.
The display is backlighted and has two lines each with 16 characters. Four indicator LEDs show the state of the system.
The RKP is shown to the right in scale 1:2.



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RS-485 and power connection

The RS-485 and power connection comprises a 4-terminal block containing bus (three terminals; two for data and a signal and power ground) and power (two terminals; one positive and a power ground). The signal ground and power ground are common. For more information about the RS-485 bus, see Section 2.2.8.

Power connection

Power input to the RKP and power output to any following RKP are both connected to the same terminals.
Thus, the voltage available at the power terminals corresponds to supply voltage to the RKP.

Indicator LEDs

Symbol	*Name and colour*	*Lit*	*Unlit*	*Flashing*
≃	"Power" (green)	Power is on.	Power is off.	CU Battery operation. (Mains fault)
((•))	"Alarm" (red)	*Service* mode, *Alarm* or *Error.*	*Normal* mode. No *alarms* or *Errors.*	Not applicable.
🔒	"Set" (yellow)	The Intruder Alarm System is set.	The Intruder Alarm System is unset.	Not applicable.
=/=	"System Failure" (yellow)	System failure present.	No system failure.	Not applicable.

Keypad

Keys	*Function or description*
0 to 9	Numerical keys for entry of pin codes, user identity, menu numbers, and parameters.
🔒	Key for setting of the Intruder Alarm System.
🔓	Key for unsetting the Intruder Alarm System.
🔕	Key for clearing of alarms and faults.
→	Key for selecting a displayed menu function or for displaying additional information of a selected menu function.
C	Key for clearing the last entry of a number, for stepping backwards in the menu system if no entry was made, and for log-out.
↓	Key for stepping forwards in the menu system or for terminating an entry.

Buzzer

The RKP contains a buzzer that is used for acoustical indication of alarm/fault and entry/exit time. The buzzer is also activated shortly to indicate operating faults.

Display

The display has two lines of each 16 characters displaying the status of the system and operating instructions. Normally date and time are displayed. The backlight is turned on as soon as the keyboard is operated and automatically turned off again two minutes (normally) after the last operation of the keypad.

Installation

Instructions for disassembly, mounting, connection, etc., of the RKP are provided in Section 3.4.

Specifications

Parameter	***Value or description***
Supply voltage:	10 V – 30 V DC.
Current consumption:	At 12 V DC: Typically 60 mA. At 24 V DC: Typically 60 mA. With backlight on, add 60 mA to the consumption.
Display:	Two lines each with 16 characters.
Keypad:	16-button keypad consisting of six function keys and ten numeric keys (0 – 9).
Indicator LEDs:	One green, one red and two yellow LEDs.
RS-485 bus:	3-wire bus including a common signal ground.
Cable type:	Shielded or unshielded, twisted pairs.
Conductor dimension:	0.6 mm (0.25 mm^2).
Max. cable length:	1200m.
Power output: (RS-485 bus terminals)	Output voltage corresponds to supply voltage to terminals. Power ground is common with RS-485 signal ground.
Environmental:	
Temperature range:	-5 °C to +60 °C.
Humidity range:	0 - 96% RH, non-condensing.
IP-class:	IP42.
Material:	Pale grey plastic housing.
Dimensions: Height:	234 mm.
Width:	95 mm.
Depth:	51 mm.
Weight:	305 g.
Accessories included:	Self-adhesive blank label.

2.2.5 Intruder Alarm Keypad - RKP-E

Description

The Intruder Alarm Keypad RKP-E is designed for in-door wall mounting with a cabinet made in stainless steel with satin finish.

It has a keypad with six function keys and ten digit keys.
The display is backlighted and has two lines each with 16 characters.
Four indicator LEDs show the state of the system.

The functionality of the RKP-E is similar to that of the RKP. Please refer to Section 2.2.4 for additional information.

The RKP-E is shown to the right in scale 1:2.

Installation

Instructions for disassembly, mounting, connection, etc., of the RKP-E is provided in Section 3.4.

Specifications

The specifications for the RKP-E are similar to those of the RKP except for material and dimension. See Section 2.2.4 and the table below.

Parameter	*Value or description*
Material:	Stainless steel with black plastic base.
Dimensions:	Height: 182.5 mm. Width: 107 mm. Depth: 36 mm. Weight: 705 g.

2.2.6 External Display Module - EDM

Description

The External Display Module is used for display of count down time in connection with the Time Lock function of the ThorGuard Central Unit.

The External Display Module is shown to the right in scale 1:2.

Mounting

The installation of the External Display Module is described in Section 3.5.

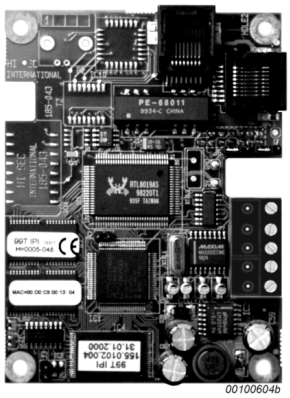
Specifications

Parameter	*Value or description*
Supply voltage:	10 V – 30 V DC.
Current consumption:	At 12 V DC: Max. 30 mA. At 24 V DC: Max. 20 mA. With backlight on, add 60 mA to the consumption.
Display:	Two lines each with 16 characters.
Keypad	Two function keys.
Indicator LED:	One green LED.
Environmental:	
Temperature range:	-5 °C to +60 °C.
Humidity range:	0 - 96% RH, non-condensing.
Dimensions: Height:	75 mm
Width:	127 mm
Depth:	30.5 mm
Weight:	140 g

2.2.7 TCP/IP interface IPI

Description

The IPI is an interface board that can be used for interfacing the ThorGuard Central Unit to TCP/IP networks.
The IPI provides an Ethernet connection to a 10baseT LAN/WAN through a RJ 45 connector on the interface or a PPP connection to a LAN/WAN.
The TCP/IP interface IPI is shown to the right in scale 1:2.



The TCP/IP interface IPI is mounted on top of the Controller board of the ThorGuard Central Unit in a 12-pin socket and fixed on four metal stays.

For setup of the interface, you can connect to the interface either via the RS-232 interface or via the TCP/IP network using the default TCP/IP address and get access from your web browser to a number of home pages for the setup task.

Installation

The installation of the IPI is described in Section 3.3. The installation comprises – apart from the mounting and connection – also its configuration. This task is described in the Installation instructions for the IPI, reference No. 94000401 (English version), that also contains additional information about the applications and uses of the IPI.

☛ Please note the IPI TCP/IP interface can only be used in connection with ThorGuard CPU-board version 2.0. See page 3-11.

Specifications

Parameter	*Value or description*
RS-232 port:	For GPI connection (Screw terminals).
Baud rate:	9600 Baud (Default).
Flow control:	XON/XOFF (Default).
Data bits:	8 (Default).
Parity:	Even (Default).
Stop bits:	1 (Default).
Selection:	By jumper setting (J6 and J7).
TCP/IP port:	10baseT Ethernet interface.
Baud rate:	10Mbit/s.
Connector:	RJ 45.
Cable:	According to Category 5.
Cable length	Max. 100m.
Supply voltage:	9 to 30 V DC.
Current consumption:	
At 12 V DC:	Typically 110 mA.
At 24 V DC:	Typically 60 mA.
Temperature range:	-10 to +60 °C.
Dimensions: Height:	100 mm.
Width:	74 mm.
Depth:	22 mm.
Weight:	60 g.
Mounting accessories included:	Three self-adhesive stays. Four plastic stays. 14 mm M3 screw with washer and M3 nut. M3 threaded stay with M3 threaded stud.

2.2.8 RS-485 bus

Introduction

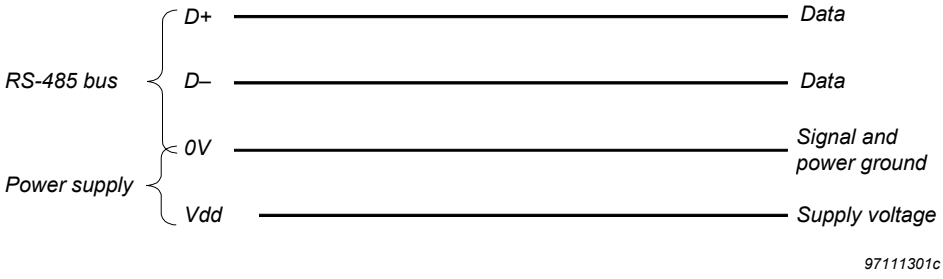
The RS-485 bus interconnects the Intruder Alarm Keypad RKP or RKP-E and other units such as the External Display Module. It controls the interchange of data between the units and the ThorGuard Central Unit. The RS-485 bus can handle 31 addressable units. However, two addresses are occupied by the Central Unit Board. Consequently, only 29 addresses are left for other units.

The RS-485 bus (See Fig. 2.3 below) consists of three wires of which two are used for the transmission of data. They are usually labelled “D+” and “D–“. The third is a common signal and power ground, usually labelled “0V”. Together with the power ground, a fourth wire – usually labelled “24V” on the RKP and RKP-E and “Vdd” on the CPU-board of the ThorGuard Central Unit – carries the operating voltage for the interconnected Intruder Alarm Keypads.
The operating voltage is usually 14.3 V DC. However, it may be 28.3 V DC, if either the 24 V version of the ThorGuard Central Unit or a 24 V DC auxiliary power supply is used. See Section 3.2.7.

Termination

The RS-485 bus must be terminated with a fixed resistance in both ends. Units delivered by HI SEC International for connection to the bus are all equipped with a terminating resistor (End-of-line resistor). The resistor can be set ON or OFF by means of a jumper or a switch.

Fig. 2.3 *The RS-485 bus and power supply.*



The interchange of data via a bus calls for addressing of the Intruder Alarm Keypads. After the installation, the required address for each Intruder Alarm Keypad is set during their initialization.

Interconnection

All Intruder Alarm Keypads are connected in parallel on the bus. You may only use star-connection of an Intruder Alarm Keypad if it is situated close to another Intruder Alarm Keypad. The cable length of a star-connected Intruder Alarm Keypad must not exceed 0.3m.

Cable dimension and length

The RS-485 bus and the power supply for the Intruder Alarm Keypads and installed equipment are contained in the same cable to keep installation costs low and installation simple. Thus, the actual power requirements will determine the cable dimension to use.

The cable should be shielded or unshielded, twisted pairs cable with a minimum conductor dimension of 0.6 mm (0.25 mm^2). The total length of the RS-485 bus should not exceed 1200 m.

Installation

Connection of the RS-485 bus to the ThorGuard Central Unit is described in Section 3.2.6. Connection of the Intruder Alarm Keypad RKP or RKP-E to the RS-485 bus is described in Section 3.4.3. The connection of the External Display Module is described in Section 3.5.

2.2.9 S-ART buses

The S-ART

The S-ART (*S*erial *A*ddressable *R*eceiver *T*ransmitter) is an integrated circuit, receiving or transmitting data on a 2-wire cable – S-ART bus – that also supplies its operating power (17 V DC). The S-ART is addressable and can thus be called with regular intervals by a controller to transmit or receive data.
The controller is situated on the CPU-board of the ThorGuard Central Unit. As standard it can handle four S-ART buses. Additionally, four, eight or twelve S-ART buses can be added by installing one, two or three S-ART 120 Expansion Boards, respectively. See Section 2.2.2 for more information.
Power for operating relays in S-ART Units and detectors and output devices, etc., connected to S-ART Units, is supplied via two wires running in the same cable as the S-ART bus.

The S-ART bus

The S-ART bus transfers data to and from the S-ART and supplies the power required to operate the S-ART. The power requirement of the S-ART itself is small, requiring only a small cable dimension.
The 17 V derived from the S-ART bus for powering the S-ART is independent of any supply voltage to the *S-ART Units*. Thus, the actual voltage available for the S-ART will depend only on the voltage drop on the cable for the bus.

Up to four S-ART lines (buses) may be connected to the S-ART bus controller - each bus can handle up to 30 S-ART addresses, meaning that up to 120 S-ART Units each with one address may be connected and operated by the ThorGuard Central Unit controller. Adding an S-ART 120 Expansion Board additionally 120 S-ARTs (Addresses) can be handled by the controller. Up to three S-ART 120 Expansion Boards can be added.

Fig. 2.4 *Schematic diagram of the connection of an S-ART line to the terminals of the ThorGuard Central Unit and the S-ART Units.*

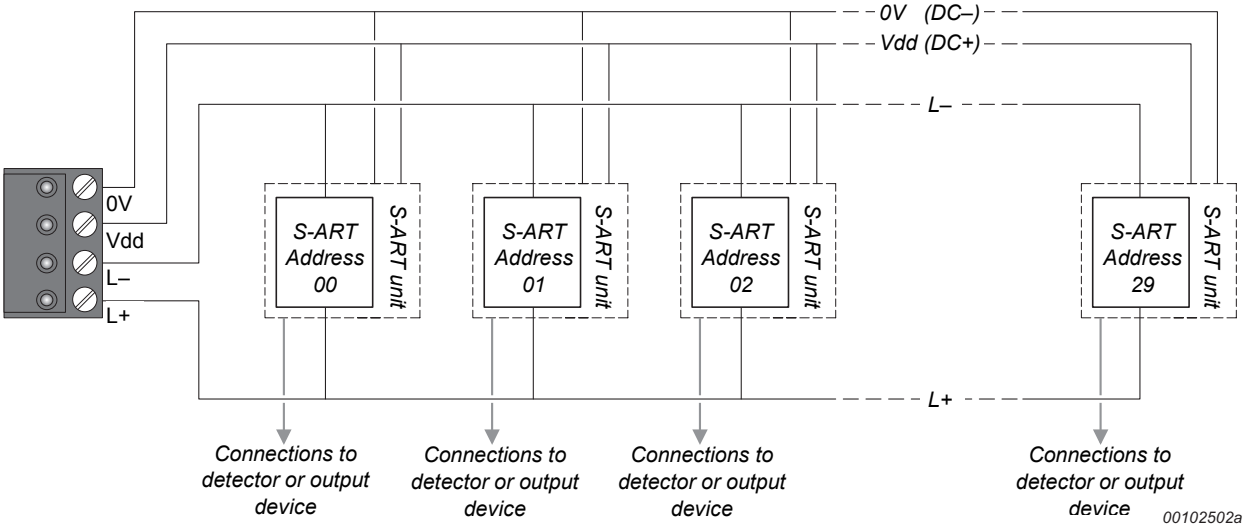


Fig. 2.4 above shows a schematic diagram of one S-ART bus and its connection to the controller and the individual S-ART Units. Each set of terminals for an S-ART bus has four screw terminals. Two for the S-ART bus (“L+” and “L– “) and two for the operating voltage required by some S-ART Units (“12/24V” and “0V” on the S-ART Units and “Vdd” and “0V” on the ThorGuard Central Unit).

The voltage available on the “Vdd” and terminal is usually 14.3 V DC. However, it may also be 28.3 V DC, if either the 24 V version of the ThorGuard Central Unit or an auxiliary 24 V DC power supply is used. See Section 3.2.7.

☛ On diagrams in this manual and in the specifications in the following sections, the S-ART bus itself is labelled L+ and L–, while the operating voltage is usually labelled DC+ and DC–.

Bus signals

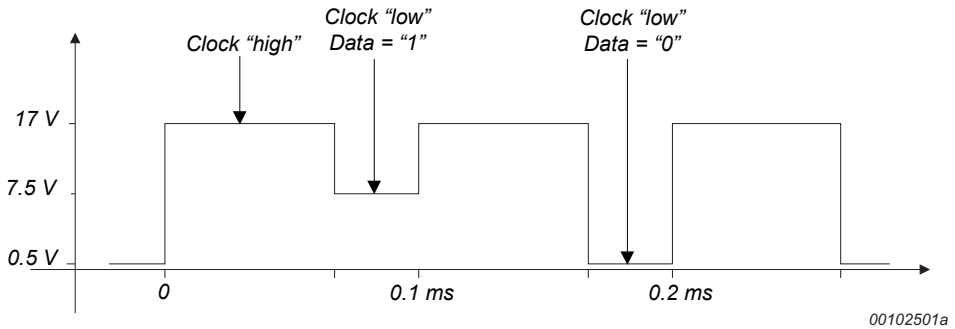
The S-ART transmission includes 10 bits. When an S-ART recognizes its own address, it reacts corresponding to the read/write bit as follows:

1 - Data for the two outputs (OUT 0 and OUT 1) are latched.

2 - Data of the two inputs (IN 0 and IN 1) are transferred to the S-ART controller.

The line signal is divided into 3 levels in order to transmit DATA as well as CLOCK.

Fig. 2.5 *The signal levels on the S-ART bus.*



Specifications

Parameter	*Value or description*
Current consumption:	S-ART bus: Typ. 60 mA (L+, L–) per bus. Vdd: Max. 500 mA (DC+, DC–). Total DC for four lines: 750 mA (L+, L– and DC+, DC–).
Automatic fuses on CPU board:	S-ART line: 100 mA (L+, L–). Vdd: 500 mA (DC+, DC–).
Cable length:	500 m shielded or 1000m unshielded, twisted pair cable, 0.6 mm (0.25mm2) or 0.9 mm (0.6mm2). Separate cable for each S-ART bus.
S-ART addresses:	The addresses of the S-ARTs can be set in the range from 1000 to 4999 for the onboard S-ART Controller as well as the S-ART 120 Expansion Boards. See below.
Detection time:	Max. 250ms (software controlled).

S-ART address allocation

The address range for the onboard S-ART Controller as well as the installed S-ART 120 Expansion Boards is programmed by individually specifying the first (lowest) address for the onboard S-ART Controller and for each S-ART 120 Expansion Board. The subsequent 119 address will then automatically be allocated also.

Example If you set the lowest address for the onboard S-ART Controller to 1100, the highest address available for the Controller will be 1219 (1100+119). These addresses (1100 – 1219) will automatically be distributed as follows:

S-ART Bus 1 (“S-ART 100”): 1100 – 1129 S-ART Bus 2 (“S-ART 200”): 1130 - 1159

S-ART Bus 3 (“S-ART 300”): 1160 - 1189 S-ART Bus 4 (“S-ART 400”): 1190 - 1219

Please note that the highest address that can be specified during programming is 4880 giving the address range 4880 to 4999 (4880+119).

Installation

Installation of the S-ART 120 Expansion Boards is described in Section 3.6. Connection of the S-ART bus is described in Section 3.7. Installation of the various S-ART Units is described in Section 3.8.

The S-ART Units available

The S-ART is used in variety of S-ART Units for various purposes. The following sections 2.2.10 to 2.2.22 provide descriptions including main application and specifications of the nine S-ART Units available.

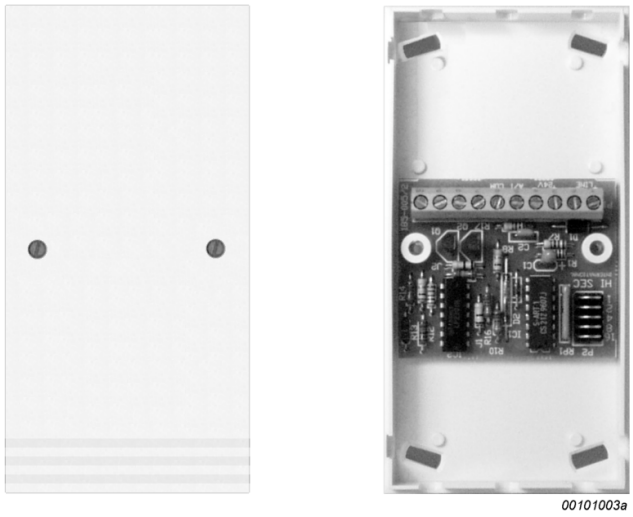
2.2.10 S-ART Unit S-100 (Discontinued)

Description

The S-ART Unit S-100 has one common alarm/tamper input with one end-of-line resistor. It is used for monitoring of door contacts, window contacts, etc. with no need for power supply.
It has two loop terminals for the DC+ (Vdd) and DC– (0 V) wires.
The internal tamper contact is a microswitch. It includes tamper monitoring on the same cable.
Mounting and installation information is provided in Sections 3.8.1 and 3.8.2.

☛ Please note that the S-ART Unit S-100 is substituted by the S-ART Unit S-120.

Fig. 2.6 *S-ART Unit S-100 with front cover mounted and removed (Scale 1:2).*



Specifications

Parameter		*Value or description*
Alarm/tamper loop:		Any voltage free contact normally closed.
Terminating resistor R_{eol}:		21.5 kΩ, 1%.
Alarm resistor R_a:		4.7 kΩ, 1%.
Max. length of cable:		50 m (Between contact and S-ART Unit).
S-ART line current consumption:		Typically 2 mA (L+, L–).
Own current consumption:		0 mA (DC+, DC– or Vdd, 0V)
Temperature range:		-25 ºC to +70 ºC.
Dimensions:	Height: Width: Depth: Weight:	130 mm. 65 mm. 20 mm. 80 g.
Accessories included:		Two resistors of 21.5 kΩ and 4.7 kΩ, respectively.

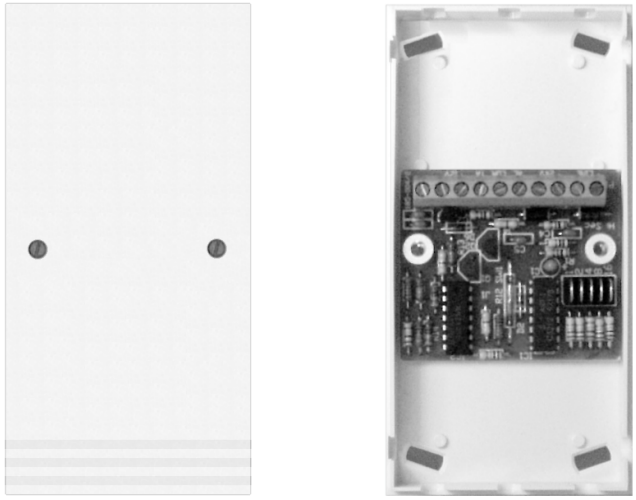
2.2.11 S-ART Unit S-101 (Discontinued)

Description

The S-ART Unit S-101 has one alarm input and one tamper input each with an end-of-line resistor. It is used for monitoring of active detectors with the need of 12 V supply for which a 12V/50 mA DC output is available. The S-ART Unit is used in 24 V systems only. The internal tamper contact is a magnetic reed contact.
Mounting and installation information is provided in Sections 3.8.1 and 3.8.3.

☛ Please note that the S-ART Unit S-101 is substituted by the S-ART Unit S-121.

Fig. 2.7 *S-ART Unit S-101 with front cover mounted and removed (Scale 1:2).*



Specifications

Parameter	*Value or description*
Alarm/tamper loop:	Any voltage free contact normally closed.
Terminating resistor R_{eol}:	21.5 kΩ, 1%.
Terminating resistor R_a:	21.5 kΩ, 1%.
Max. length of cable:	10 m (Between detector and S-ART Unit).
S-ART line current consumption:	Typically 2 mA (L+, L–).
Input voltage:	14.5 to 30 V DC (DC+, DC– or Vdd, 0V).
Own current consumption:	0 mA, excluding output current (DC+, DC– or Vdd, 0V).
Output current	Nominal: 50 mA. Max. 65 mA (V_{in}: 24 V DC at 20 ºC). Max. 30 mA (V_{in}: 28 V DC at 70 ºC).
Output voltage:	12 V DC ± 5%.
Temperature range:	-25 ºC to +70 ºC.
Dimensions:	Height: 130 mm. Width: 65 mm. Depth: 20 mm. Weight: 80 g.
Accessories included:	Two resistors of 21.5 kΩ.

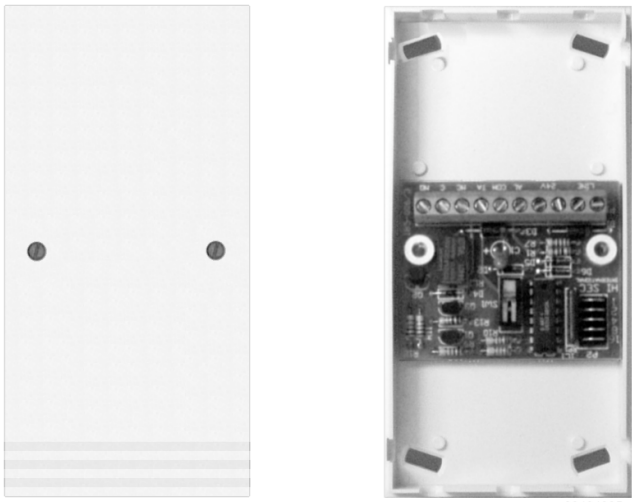
2.2.12 S-ART Unit S-102 (Discontinued)

Description

The S-ART Unit S-102 has one alarm input and one tamper input with normally closed contact. One voltage-free, 1 A change-over relay output. It is used where a relay output is needed. The internal tamper contact is a microswitch.
Mounting and installation information is provided in Sections 3.8.1 and 3.8.4.

☛ Please note that the S-ART Unit S-102 is substituted by the S-ART Unit S-122.

Fig. 2.8 *S-ART Unit S-102 with front cover mounted and removed (Scale 1:2).*



Specifications

Parameter	*Value or description*
Alarm/tamper loop:	Any voltage free contact normally closed.
Terminating resistor R_{eol}:	None.
Terminating resistor R_a:	None.
Max. length of cable:	10 m (Between detector and S-ART Unit).
S-ART line current consumption:	Typically 2 mA (L+, L–).
Input voltage:	14.5 to 30 V DC (DC+, DC– or Vdd, 0V).
Own current consumption: (DC+, DC– or Vdd, 0 V)	0 mA, (Relay in normal). 12 mA (Relay activated).
Relay switching voltage:	Max. 125 V AC or 150 V DC.
Relay contact current:	Max. 1 A.
Relay switching power:	Max. 30 W or 60 VA.
Temperature range:	-25 ºC to +70 ºC.
Dimensions:	Height: 130 mm. Width: 65 mm. Depth: 20 mm. Weight: 80 g.

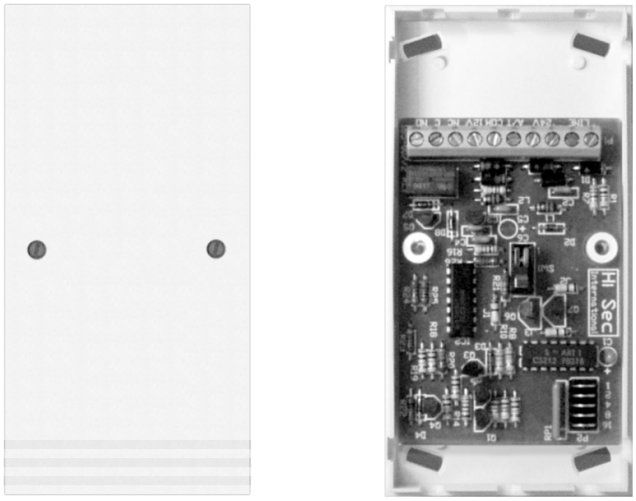
2.2.13 S-ART Unit S-103 (Discontinued)

Description

The S-ART Unit S-103 has one alarm/tamper input with one end-of-line resistor. Can be used with long cables between the detector and the S-ART Unit. One voltage-free, 1 A change-over relay output. It is used for monitoring of active detectors with the need of 12 V supply for which a 12V/50 mA DC output is available.
It is used in high security installations where a special surveillance of the alarm/tamper input is needed. The internal tamper contact is a microswitch. Mounting and installation information is provided in Sections 3.8.1 and 3.8.5.

☛ Please note that the S-ART Unit S-103 is substituted by the S-ART Unit S-123.

Fig. 2.9 *S-ART Unit S-103 with front cover mounted and removed (Scale 1:2).*



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Specifications

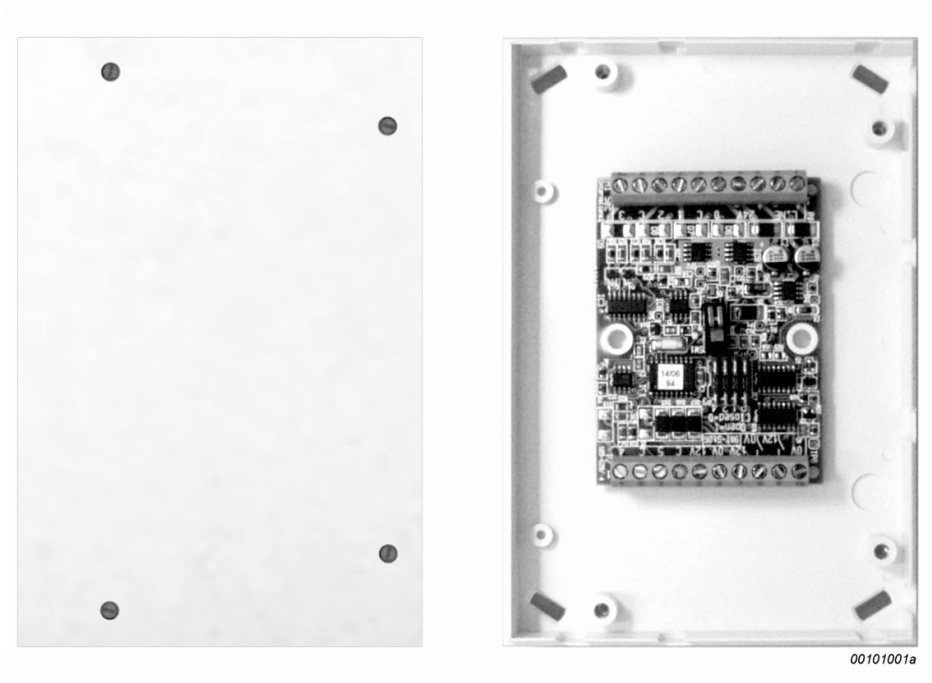
Parameter	*Value or description*
Alarm/tamper loop:	Any voltage free contact normally closed.
Terminating resistor R_{eol}:	21.5 kΩ, 1%.
Alarm resistor R_a:	3.9 kΩ, 1%.
Max. length of cable:	1000 m (Between detector and S-ART Unit).
Input voltage:	14.5 to 30 V DC (DC+, DC– or Vdd, 0V).
S-ART Line current consumption:	Typically 2 mA (L+, L–).
Own current consumption:	0 mA, excluding output current (DC+, DC– or Vdd, 0V).
Output voltage:	12 V DC ± 5%.
Output current:	Max. 50 mA Max. 30 mA (V_{in} = 28 V DC at +70 ºC). Max. 65 mA (V_{in} = 24 V DC at +20 ºC).
Relay switching voltage:	Max. 125 V AC or 150 V DC.
Relay contact current:	Max. 1 A.
Relay switching power:	Max. 30 W or 60 VA.
Temperature range:	-25 ºC to +70 ºC.
Dimensions:	Height: 130 mm. Width: 65 mm. Depth: 20 mm. Weight: 90 g.
Accessories included:	Two resistors of 21.5 kΩ and 3.9 kΩ, respectively.

2.2.14 S-ART Unit S-106

Description

The S-ART Unit S-106 is designed for installations where several detectors are close to each others. The S-106 contains six alarm/tamper inputs (0 to 5) and one NPN (open collector) or PNP (open emitter) output. This output is linked to alarm loop 0. The internal tamper switch is a microswitch. S-106 is used for monitoring of active detectors with the need of 12 V supply for which a 12V/50 mA DC output is available.
The S-106 is delivered in housing larger than the normal housing to provide additional space for cables.
Mounting and installation information is provided in Sections 3.8.1 and 3.8.6.

Fig. 2.10 *S-ART Unit S-106 with front cover mounted and removed (Scale 1:2).*



Specifications

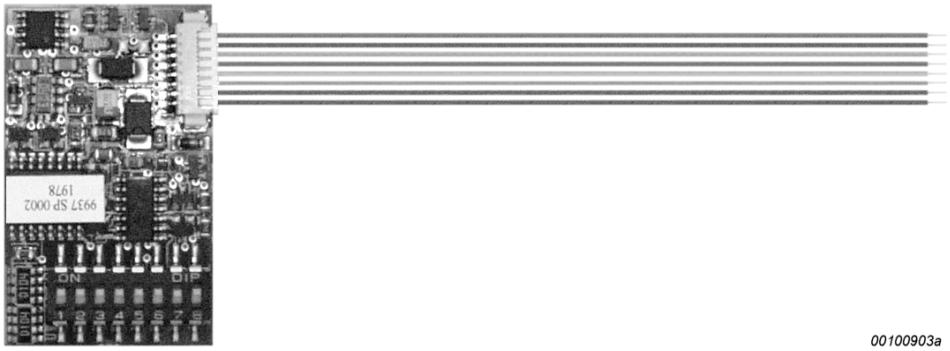
Parameter		*Value or description*
Alarm/tamper loop:		Any voltage free contact normally closed.
Terminating resistor R_{eol}:		10 kΩ, 1%.
Alarm resistor R_a:		2.2 kΩ, 1%.
Max. length of cable:		1000 m (Between detector and S-ART Unit).
Input voltage: :		14.5 to 30 V DC (DC+, DC– or Vdd, 0V).
S-ART Line current consumption:		Typically 8 mA (L+, L–).
Own current consumption:		10 mA, excluding output current (DC+, DC– or Vdd, 0V).
Output voltage:		12 V DC± 5%.
Output current:		Max. 50 mA.
Temperature range:		-25 ºC to +70 ºC.
Dimensions:	Height: Width: Depth: Weight:	158 mm. 106.5 mm. 20.3 mm. 135 g.
Accessories included:		Six resistors of 10 kΩ and six resistors of 2.2 kΩ.

2.2.15 S-ART Unit S-107

Description

The S-ART Unit S-107 is a miniature S-ART Unit that can be mounted inside various detectors. It is supplied with a connection cable for direct connection to the terminals of the detector. The S-ART Unit is fixed inside the detector by means of a self-adhesive pad fixed to the rear side of the S-ART Unit.
One alarm/tamper loop and one transistor output. It is used for monitoring of active detectors with the need of 12 V supply for which a 12V/50 mA DC output is available. The S-ART Unit contains no internal tamper switch.
Mounting and installation information is provided in Section 3.8.7.

Fig. 2.11 *S-ART Unit S-107 (Scale 1:1).*



Specifications

Parameter	*Value or description*
Alarm/tamper loop:	Any voltage free contact normally closed.
Terminating resistor R_{eol}:	21.5 kΩ or 10 kΩ, 1%.
Alarm resistor R_a:	10 kΩ or 4.7 kΩ, 1%.
Input voltage:	14.5 to 30 V DC (DC+, DC– or Vdd, 0V).
S-ART Line current consumption:	Typically 2 mA (L+, L–).
Own current consumption:	0 mA, excluding output current (DC+, DC– or Vdd, 0V).
Output current:	Max. 30 mA.
Output voltage:	12 V DC ± 5%.
Temperature range:	-25 ºC to +70 ºC.
Dimensions: Height: Width: Depth: Length of leads: Weight:	46 mm. 28 mm. 6 mm. 100 mm. 8 g incl. leads.
Accessories included:	Three resistors of 10 kΩ, 4.7 kΩ, and 21.5 kΩ, respectively. 8-lead connection cable with connector.

2.2.16 S-ART Unit S-108

Description

The S-ART Unit S-108 is a sub-miniature S-ART Unit that can be mounted inside various detectors. It is equipped with leads for direct connection to the terminals of the detector by means of five leads. The S-ART Unit is fixed inside the detector by means of a self-adhesive pad fixed to the rear side of the S-ART Unit. It contains no internal tamper switch.
Mounting and installation information is provided in Section 3.8.8.

Fig. 2.12 *S-ART Unit S-108 (Scale 1:1).*

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Specifications

Parameter	*Value or description*
Alarm/tamper loop:	Any voltage free contact normally closed.
Terminating resistor R_{eol}:	None.
Alarm resistor R_a:	None
S-ART Line current consumption:	Typically 0.8 mA (L+, L–).
Temperature range:	-25 ºC to +70 ºC.
Dimensions: Height: Width: Depth: Length of leads: Weight:	25 mm. 25 mm. 4.5 mm. 100 mm. 4 g.
Accessories included:	5-lead connection cable with connector.

2.2.17 S-ART Unit S-112

Description

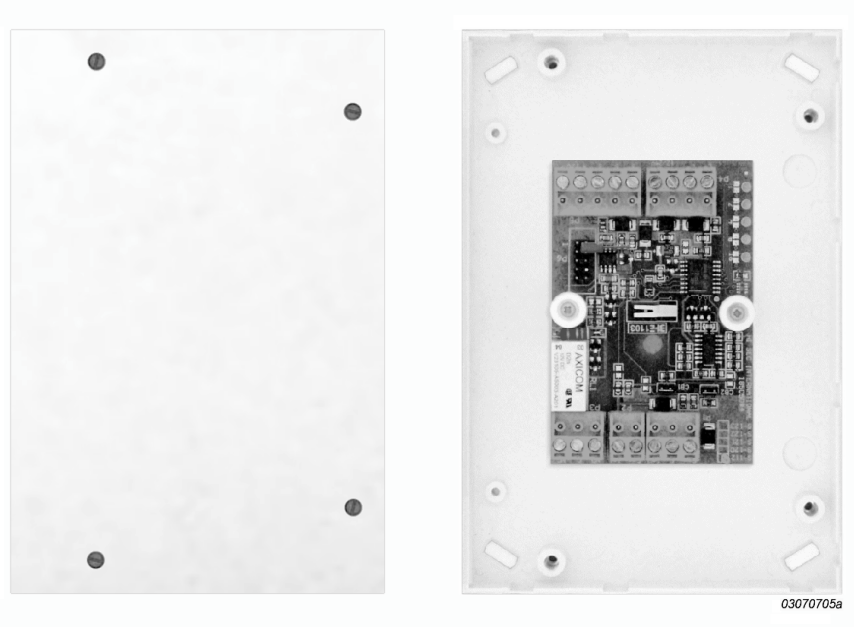
The S-ART Unit S-112 is intended for access control as well as intruder alarm system where a relay output is needed; thus it can replace S-ART Units types S-101 and S-102. In access control systems, it is specifically used in connection with door installations.
The S-112 is delivered in a large housing to provide additional space for cables.

The S-112 is equipped with a voltage free change-over relay that may switch loads up to 60 W or 120 VA. The current is limited by a resistor and an auto-fuse.
For detectors that need a 12 V DC supply, a 12V/30 mA DC output is available when the S-112 is supplied with at least 17.5 V DC.
Jumpers allows the use of either the built-in end-of-line resistors (Jumpers OFF) or external end-of-line resistors (Jumpers ON) of 21.5 KΩ for the input loops.
The internal tamper contact is a microswitch that is mechanically protected.

The S-112 is equipped with a connector for test tool STT with LED indicators. It will show the status for S-ART line, DC supply, inputs and relay.

Mounting and installation information is provided in Sections 3.8.1 and 3.8.9.

Fig. 2.13 *S-ART Unit S-112 with front cover mounted and removed (Scale 1:2)*



Specifications

Parameter	*Value or description*
Alarm/tamper loop:	Any voltage free contact normally closed.
Terminating resistor R_{eol}:	21.5 KΩ, 1% or none.
Terminating resistor R_a:	21.5 KΩ, 1% or none.
Max. length of cable:	50 m (Between connected items and S-ART Unit).
S-ART Line current consumption:	Max. 3 mA (L+, L–).
Input voltage:	10 to 30 V DC (DC+, DC– or Vdd, 0V).
Output voltage:	12 V DC ±10% for input voltages above 17.5 V DC.
Output current:	Max. 30 mA.

Continued ...

Parameter	*Value or description*
Relay supply voltage:	9 – 30 V DC.
Relay switching voltage:	Max. 30 V DC or AC.
Relay contact current:	Max. 2 A. DC or AC
Relay switching power:	Max. 30 W or 60 VA.
Temperature range:	-25 ºC to +70 ºC.
Dimensions:	Height: 158 mm. Width: 106.5 mm. Depth: 20.3 mm. Weight: 140 g.
Accessories included:	Two resistors of 21.5 kΩ.

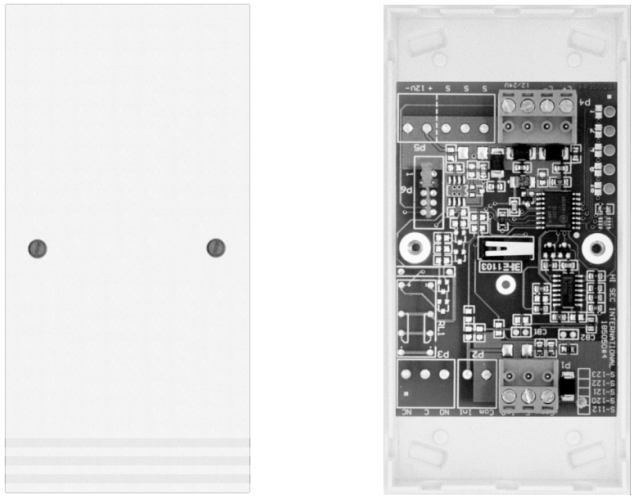
2.2.18 S-ART Unit S-120

Description

The S-ART Unit S-120 has one common alarm/tamper input with one end-of-line resistor. It is used for monitoring of door contacts, window contacts, etc. with no need for power supply. The internal tamper contact is a microswitch that is mechanically protected.
It has a single loop terminal for use when the Input Line Extender S-ILE is used for enable cable lengths of up to 2000m between the detector and the S-ART Unit. See Section 3.8.15.

Mounting and installation information is provided in Sections 3.8.1 and 3.8.10.

Fig. 2.14 *S-ART Unit S-120 with front cover mounted and removed (Scale 1:2)*



03070404a

Specifications

Parameter	*Value or description*
Alarm/tamper loop:	Any voltage free contact normally closed.
Terminating resistor R_{eol}:	21.5 kΩ 1%.
Alarm resistor R_a:	4.7 kΩ, 1%.
Max. length of cable:	100 m (Between contact and S-ART Unit).
S-ART line current consumption:	Max. 3 mA (L+, L–).
Own current consumption:	0 mA (DC+, DC– or Vdd, 0V)
Temperature range:	-25 ºC to +70 ºC.
Dimensions:	Height: 130 mm. Width: 65 mm. Depth: 20 mm. Weight: 83 g.
Accessories included:	Two resistors of 21.5 kΩ and 4.7 kΩ, respectively.

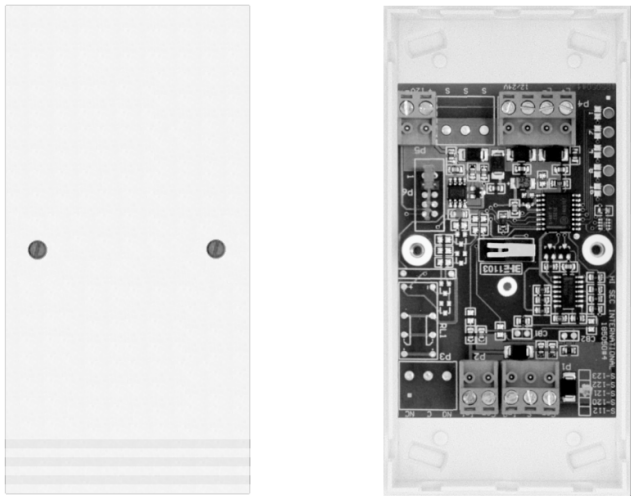
2.2.19 S-ART Unit S-121

Description

The S-ART Unit S-121 has one alarm input and one tamper input each with an end-of-line resistor. For detectors that need a 12 V DC supply, a 12V/30 mA DC output is available when the S-121 is supplied with at least 17.5 V DC. It has a single loop terminal. The internal tamper contact is a microswitch that is mechanically protected.

Mounting and installation information is provided in Sections 3.8.1 and 3.8.11.

Fig. 2.15 *S-ART Unit S-121 with front cover mounted and removed (Scale 1:2)*



03070703a

Specifications

Parameter	*Value or description*
Alarm/tamper loop:	Any voltage free contact normally closed.
Max. length of cable:	100 m (Between detector and S-ART Unit).
Terminating resistor R_{eol}:	21.5 kΩ.
Terminating resistor R_a:	21.5 kΩ.
S-ART line current consumption:	Max. 3 mA (L+, L–).
Input voltage:	17.5 to 30 V DC (DC+, DC– or Vdd, 0V).
Own current consumption:	0 mA, excluding output current (DC+, DC– or Vdd, 0V).
Output current	Max. 30 mA.
Output voltage:	12 V DC ±10% for input voltages above 17.5 V DC.
Temperature range:	-25 ºC to +70 ºC.
Dimensions:	Height: 130 mm. Width: 65 mm. Depth: 20 mm. Weight: 87 g.
Accessories included:	Two resistors of 21.5 kΩ.

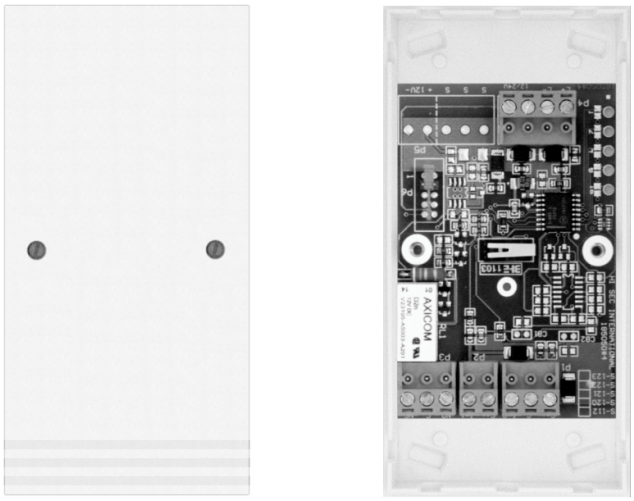
2.2.20 S-ART Unit S-122

Description

The S-ART Unit S-122 has one alarm input and one tamper input each with an end-of-line resistor. It is equipped with a voltage free change-over relay that may switch loads up to 60 W or 120 VA. The current is limited by a resistor and an auto-fuse. It has a single loop terminal. The internal tamper contact is a microswitch that is mechanically protected.

Mounting and installation information is provided in Sections 3.8.1 and 3.8.12.

Fig. 2.16 *S-ART Unit S-122 with front cover mounted and removed (Scale 1:2)*



Specifications

Parameter	*Value or description*
Alarm/tamper loop:	Any voltage free contact normally closed.
Terminating resistor R_{eol}:	None.
Terminating resistor R_a:	None.
Max. length of cable:	10 m (Between detector and S-ART Unit).
S-ART line current consumption:	Max. 3 mA (L+, L–).
Input voltage:	14.5 to 30 V DC (DC+, DC– or Vdd, 0V or 12/24V).
Own current consumption: (DC+, DC– or Vdd, 0 V)	0 mA, (Relay in normal). 12 mA (Relay activated).
Relay switching voltage:	Max. 30V DC or AC.
Relay contact current:	Max. 2 A DC or AC.
Relay switching power:	Max. 60 W DC or 120 VA.
Temperature range:	-25 ºC to +70 ºC.
Dimensions:	Height: 130 mm. Width: 65 mm. Depth: 20 mm. Weight: 93 g.

2.2.21 S-ART Unit S-123

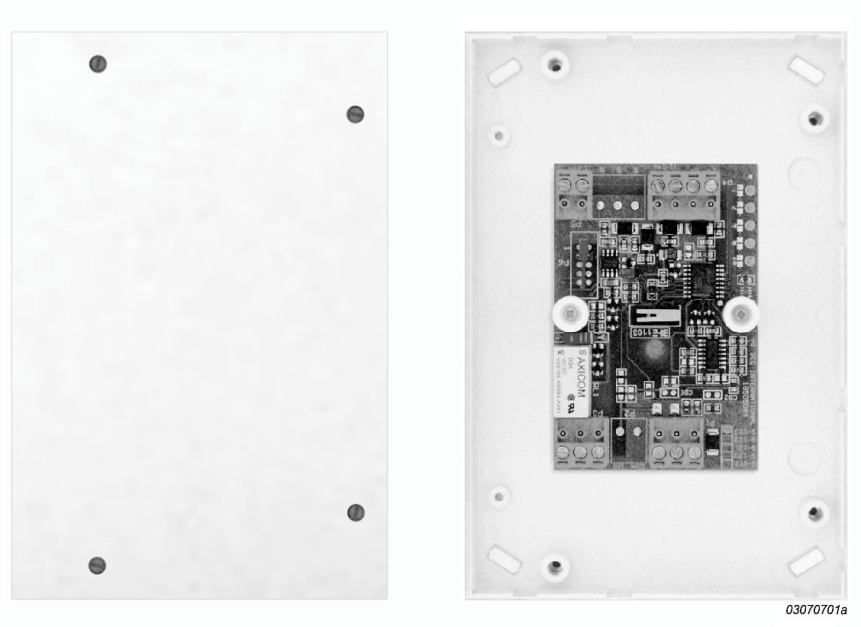
Description

The S-ART Unit S-103 has one alarm/tamper input with one end-of-line resistor. It is equipped with a voltage free change-over relay that may switch loads up to 60 W or 120 VA. The current is limited by a resistor and an auto-fuse.

For detectors that need a 12 V DC supply, a 12V/30 mA DC output is available when the S-123 is supplied with at least 17.5 V DC. The internal tamper contact is a microswitch that is mechanically protected.
It has a single loop terminal for use when the Input Line Extender S-ILE is used for enable cable lengths of up to 2000m between the detector and the S-ART Unit. See Section 3.8.15.

Mounting and installation information is provided in Sections 3.8.1 and 3.8.13.

Fig. 2.17 *S-ART Unit S-123 with front cover mounted and removed (Scale 1:2)*



Specifications

Parameter	*Value or description*
Alarm/tamper loop:	Any voltage free contact normally closed.
Terminating resistor R_{eol}:	21.5 kΩ, 1%.
Alarm resistor R_a:	4.7 kΩ, 1%.
Max. length of cable:	100 m (Between detector and S-ART Unit).
Input voltage:	14.5 to 30 V DC (DC+, DC– or Vdd, 0V).
S-ART Line current consumption:	Max. 3 mA (L+, L–).
Own current consumption:	0 mA, excluding output current (DC+, DC– or Vdd, 0V).
Output voltage:	12 V DC ± 5%.
Output current:	Max. 30 mA.

Continued ...

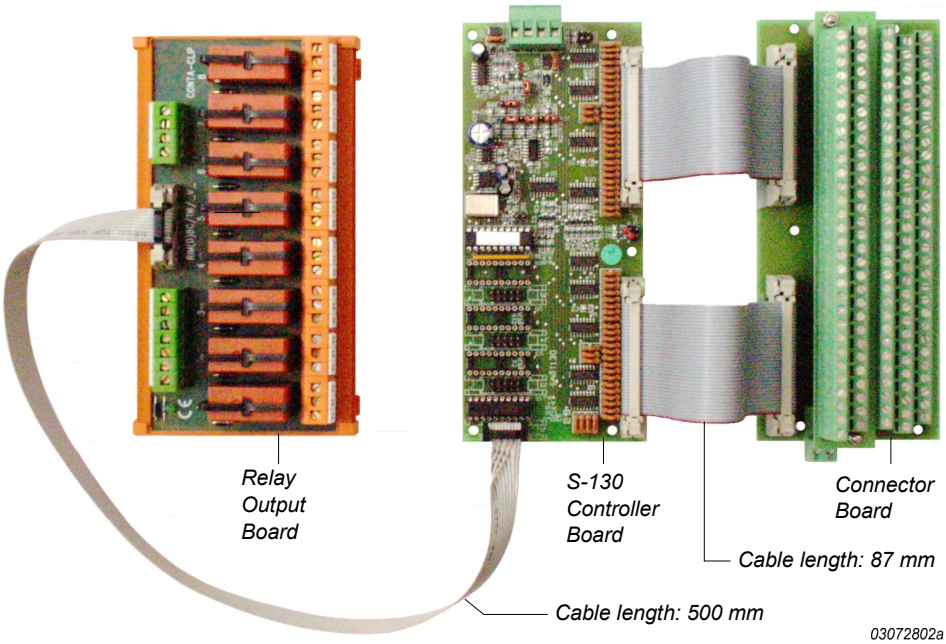
Parameter		***Value or description***
Relay switching voltage:		Max. 30V DC or AC.
Relay contact current:		Max. 2 A DC or AC.
Relay switching power:		Max. 60 W DC or 120 VA.
Temperature range:		-25 ºC to +70 ºC.
Dimensions:	Height: Width: Depth: Weight:	130 mm. 65 mm. 20 mm. 136 g.
Accessories included:		Two resistors of 21.5 kΩ and 4.7 kΩ, respectively.

2.2.22 S-ART Unit S-130

Description

The S-ART Unit S-130 has thirty alarm inputs with an end-of line resistor that can be set to 2.2 kΩ, 5.6 kΩ or 10 kΩ. Thirty selectable polarity anti-mask inputs for use with detectors with an anti-mask facility is also present together with thirty open collector outputs with indicator LEDs via optional Relay Output Boards. Contains no internal tamper switch, but has input for a tamper switch to be mounted in the housing used. The housing is not supplied.
Mounting and installation information is provided in Section 3.8.14.

Fig. 2.18 *S-130 with Controller and Connector boards and one Relay Output Board (Scale 1:3).*



Specifications

Parameter		*Value or description*
Number of alarm loops:		30.
Alarm/tamper loop:		Any voltage free contact normally closed.
Terminating resistor R_{eol}:		2.2 kΩ ±1 %, 5.6 kΩ ±1 %, or 10 kΩ ±1 %.
Max. length of alarm loop cable:		1000 m (Max. 200 Ω, max. 200 nF).
S-ART Line current consumption:		Typically 8 mA (L+, L–).
Supply voltage:		11 to 16 V DC (DC+, DC– or Vdd, 0V).
Own current consumption (DC+, DC–):		Typically 25 mA at 13.6 V DC (excluding outputs).
Number of outputs:		30 open collector outputs. Relay outputs available via Relay Output Boards.
Maximum supply voltage for loads:		45 V DC.
Max. output current:		250 mA with all outputs on.
Temperature range:		0 ºC to +70 ºC.
Dimensions:	S-130 controller:	Height x width x depth: 166.5 x 72 x 26 mm. Weight: 125 g.
	Connector board:	Height x width x depth: 175.5 x 72 x 49.5 mm. Weight: 285 g incl. connector cables.
	Relay Output Board:	Height x width x depth: 87 x 153 x 61 mm. Weight: 330 g incl. connector cable.
Accessories available:		Relay Output Boards with connector cable and output IC.

3

Installation

Introduction

The information contained in this chapter is needed for the installer and may be used by the system designer if specific information about the installation tasks is required.

The chapter provides an overview of the various installation tasks required connecting the various system components electrically.

This chapter

The content of this chapter is outlined in the table below.

3.1 Overview of the installation task

This section provides an overview of the tools and materials needed for the installation and things to take into considerations during and after installation. To locate the information you need for installing the various components, a list of installation tasks are provided in Section 3.1.4.

3.1.1 Before you start

Checking

Check that all items needed for the installation are present and of the correct type.

Special tools and materials

In addition to a normal set of electrician´s hand tools, you will need

- Stripping tools
- Crimping tools

If you must prepare cables for example for connection to a Local Area Network (LAN), etc.

3.1.2 During the installation

Mounting

Components intended for wall mounting should always be mounted on a plane surface. If not plane, you may deform the component when the mounting screws are tightened.

Screws

Mounting screws for the various components should be of a type and a have a length that will ensure a solid fastening to the mounting surface.

Jumpers

Jumper setting is required for a number of components in the system. When setting a jumper to OFF, do not remove it completely. Just pull it off and insert it on one of the pins. In this way, you always have the jumper at hand if its setting should be changed later.

Checking installation

During the installation, you should check carefully that you have interconnected all items according to connection diagrams and tables, and that you have set jumpers as described.

3.1.3 After the installation

Installing firmware files

After the installation has been completed, you may have to transfer firmware files to the ThorGuard Central Unit Board using the ThorGuard Boot Strap Loader if update of these files is needed. This task comprises the installation of the ThorGuard Boot Strap Loader and the transfer of firmware files. This is described in Chapter 4, Download of application software.

ThorGuard Central Unit programming

After the transfer of firmware files, the ThorGuard Central Unit requires configuring. This task is described in the manual for the ThorGuard Configuration program, Ref. No. 92003301, together with instructions for installing the program.

3.1.4 List of installation tasks

The installation tasks you will have to perform will naturally vary in accordance with the design of the system. Thus, it is not possible to provide guidelines for the sequence in which to perform the tasks. The table below lists the various tasks and the page where you can find the information you need.

	Task	*See page*
ThorGuard Central Unit	Mounting the ThorGuard Central Unit	3-5
	Connections to mains voltage	3-6
	Installing the optional battery	3-7
	Connection of inputs and outputs	3-12
	Connection of S-ART buses	3-42
	Connection of the RS-485 bus	3-15
	Battery and power connections	3-16
	Connection of the RS-232 interface	3-26
	Mounting of S-ART 120 Expansion Boards	3-40
TCP/IP interface	Mounting of the TCP/IP interface IPI	3-27
	Connection of the TCP/IP interface IPI to LAN/WAN	3-28
	Setting of jumpers	3-29
RS-485 bus	Connection of RS-485 bus to the ThorGuard Central Unit	3-15
	Connection of RS-485 bus to the RKP and RKP-E	3-35
Intruder Alarm Keypads RKP and RKP-E	Mounting of the RKP	3-30
	Mounting of the RKP-E	3-33
	Connection of the RKP and RKP-E to the RS-485 bus	3-35
	Setting of end-of-line resistor	3-36
External Display Module EDM	Mounting of the EDM	3-37
	Connection of the EDM	3-38
S-ART 120 Expansion Board	Mounting of S-ART 120 Expansion Boards	3-40
S-ART buses	Connection to the ThorGuard Central Unit	3-42
	Connection to the S-ART Units	3-43 and 3-46 to 3-63
S-ART Units	Mounting of S-ART Unit mounting boxes	3-44
	Connection of S-ART Unit S-100	3-46
	Connection of S-ART Unit S-101	3-47
	Connection of S-ART Unit S-102	3-48
	Connection of S-ART Unit S-103	3-49
	Connection of S-ART Unit S-106	3-50
	Connection of S-ART Unit S-107	3-52
	Connection of S-ART Unit S-108	3-54
	Connection of S-ART Unit S-112	3-56
	Connection of S-ART Unit S-120	3-59
	Connection of S-ART Unit S-121	3-60
	Connection of S-ART Unit S-122	3-61
	Connection of S-ART Unit S-123	3-62
	Connection of S-ART Unit S-130	3-63
	Installation of Input Line Extender S-ILE	3-68
	Coding of S-ART addresses	3-69

3.2 Installation of ThorGuard Central Unit

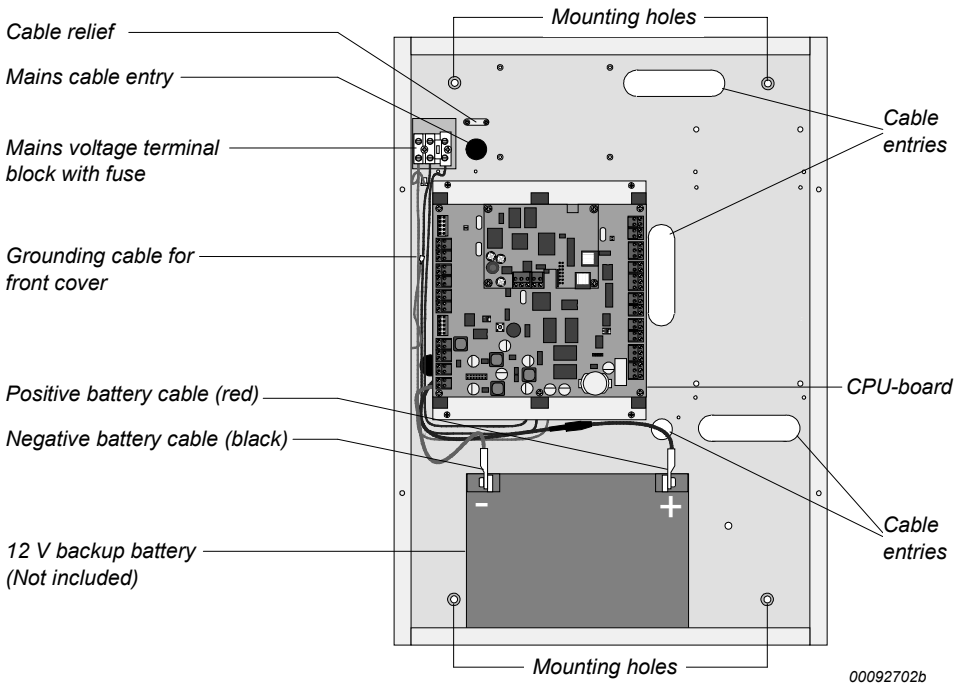
Introduction

The ThorGuard Central Unit is delivered ready for mounting. The interconnection cables (if needed) for the batteries are placed inside the cabinet in a plastic bag.

Disassembly of cabinet

To disassemble the cabinet, unscrew the four screws in the front cover using a 2.5 mm Allen key and lift the cover off.
Remember to disconnect the grounding cable on the inside of the front cover.

Fig. 3.1 *View of the ThorGuard Central Unit with front cover removed.*



Layout

With the cover off, the ThorGuard Central Unit appears as shown in the figure above.

Installation tasks

Installation of the ThorGuard Central Unit comprises the following tasks:

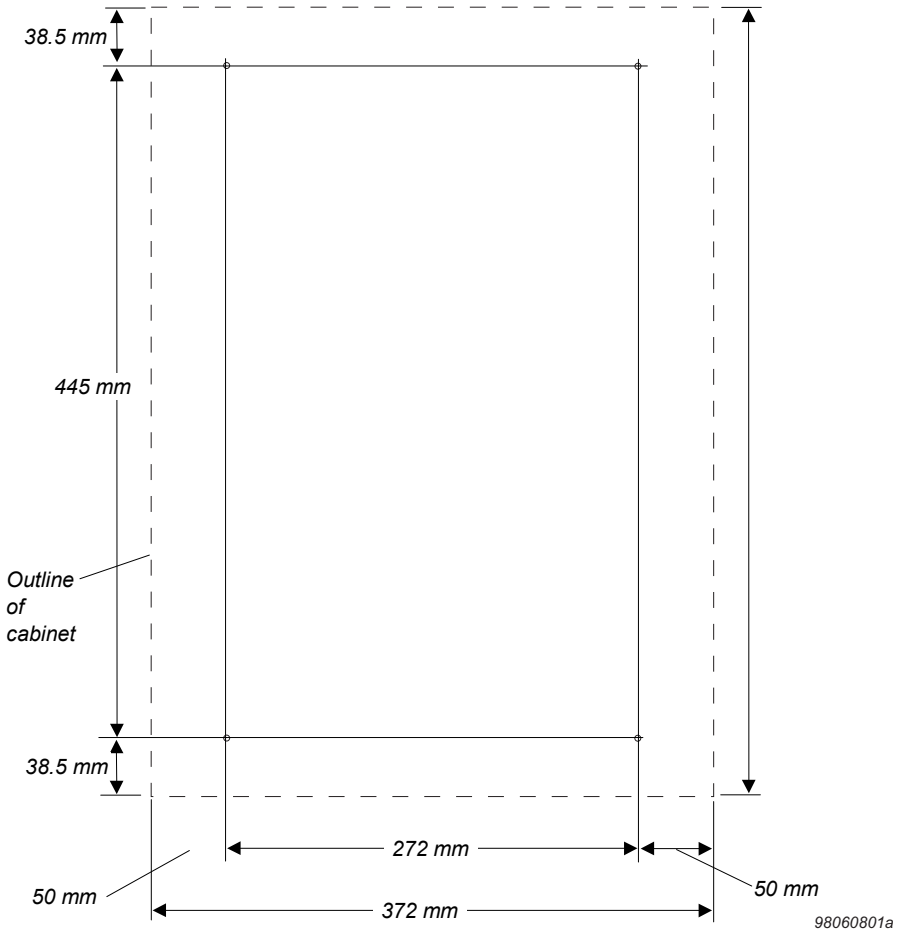
- Mounting of the cabinet.
- Installation of S-ART 120 Expansion Boards, if needed.
- Installation of TCP/IP interface IPI, if needed.
- Installation and connection of the backup battery.
- Connection to mains voltage.

3.2.1 Mounting

The cabinet is mounted by means of four screws with a diameter of approx. 5 mm. Do not use a smaller screw dimension. The screws should be able to carry the load from the backup battery.

Mark the holes to be drilled for the fastening screws. You can mark their position through the mounting holes in the cabinet or you can use the measurements on the drilling plan below.

Fig. 3.2 *Position of mounting holes.*



Before you fasten the mounting screws fully, insert all cables to be connected in to the cabinet through the cutouts and grommets.

The mains cable should be inserted through the grommet in the upper left-hand side of the cabinet. See Fig. 3.1 and Fig. 3.3.

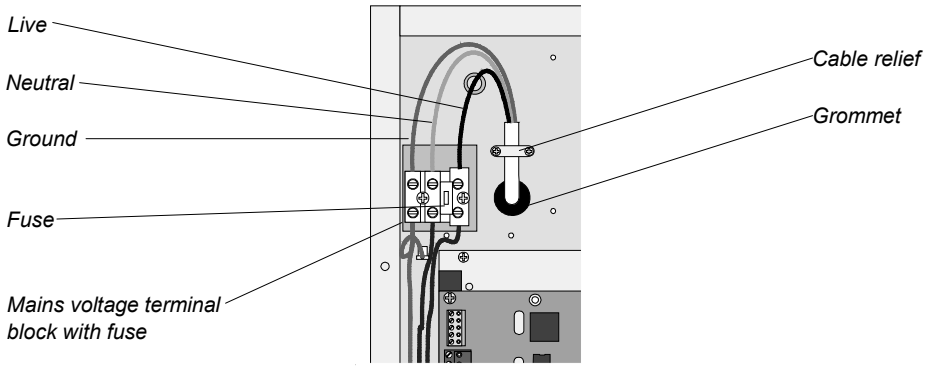
You are now ready to connect mains voltage as described in the following section.

3.2.2 Connections to mains voltage

The ThorGuard Central Unit should be connected to 230 V AC mains and ground as shown in the figure below.
Remember that local regulations may require that the ThorGuard Central Unit be installed with an external mains power switch.

✖ ***The EN 60-950 Low Voltage Directive requires that permanently connected equipment should be installed with a readily accessible disconnection device.***

Fig. 3.3 *Mounting and connection of mains cable.*



Fuse

The mains voltage terminal block is equipped with a fuse (1A slow blow) in series with the live terminal.

3.2.3 Installing back-up batteries

General information

The ThorGuard Central Unit needs back-up power to maintain operation in case of mains failure. Depending on the version of the ThorGuard Central Unit, a single or two backup batteries are needed.
The batteries are installed after you have mounted the ThorGuard Central Unit as described in Section 3.2.1.

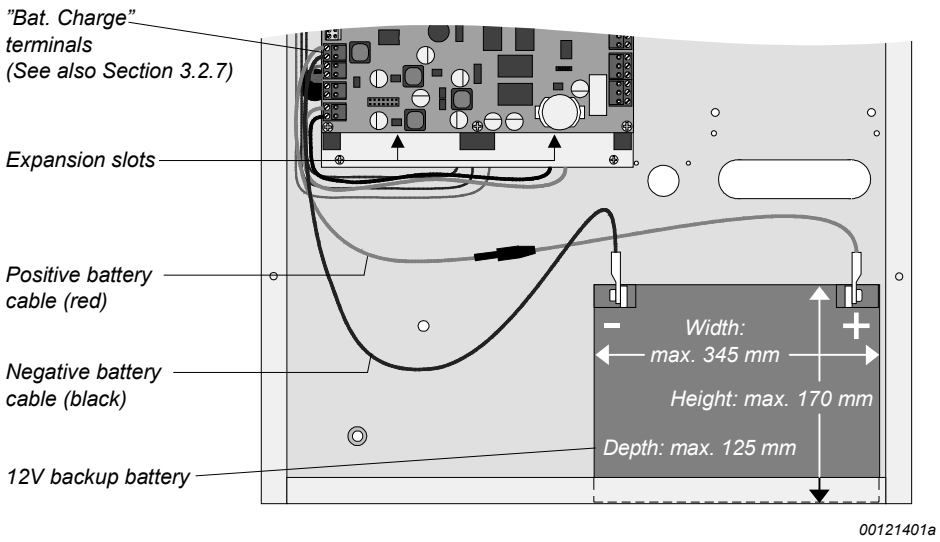
☛ If S-ART 120 Expansion Boards should be installed in the lower expansion slots No. 1 and No. 2 (See Fig. 3.6), you should do this before you install back-up batteries, since space may be insufficient after installation of the back-up batteries. Installation of S-ART 120 Expansion Boards is described in Section 3.6.

ThorGuard Central Unit – 12 V version

The ThorGuard Central Unit (12 V version) uses a single 12V back-up battery with a recommended capacity of 24 Ah. The battery is not included with the ThorGuard Central Unit.

The dimensions of the battery must not exceed those given in Fig. 3.4.

Fig. 3.4 *Connection of back-up battery. Please note the maximum dimensions.*



Connection cables

The connection cables for the backup battery are already mounted on the “Bat+” and “Bat– “ terminals of the “Bat. Charge” connector.
Mount the negative cable (black) from the “Bat– “ terminal on the negative terminal of the battery. Then, mount the positive cable (red) from the “Bat+“ terminal on the positive terminal of the battery.
When done, push the battery carefully in place.
More information about the connection including the labelling of the screw terminals is provided in Section 3.2.7.

Setting charging current

The charging current to the battery can be set to either ~1200 mA or ~1800 mA by means of a jumper. See the sections, Setting of jumpers “J1” for version 1.0 on page 3-22 and Setting of jumpers “J1” version 2.0 on page 3-19.

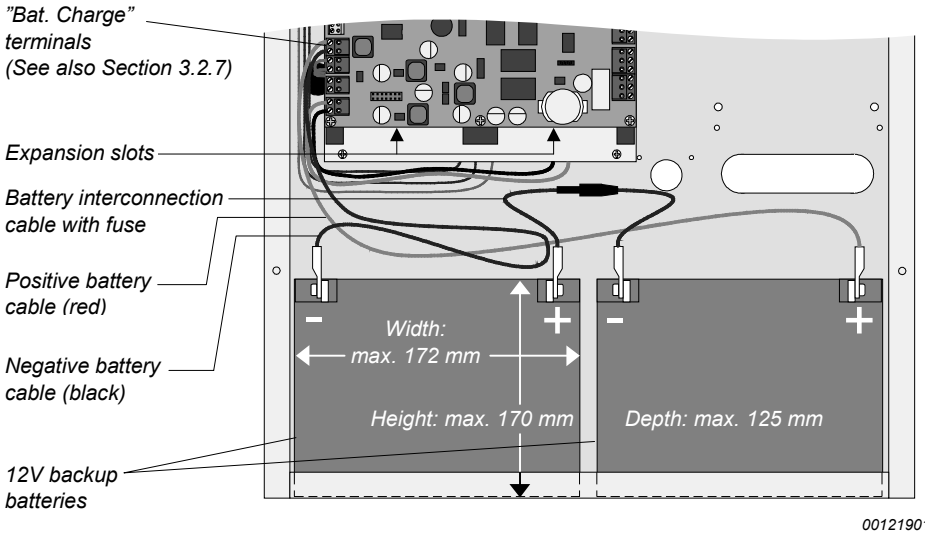
ThorGuard Central Unit – 24 V version

The ThorGuard Central Unit (24 V version) uses two 12 V back-up batteries each with a recommended capacity of 24 Ah. The batteries are not included with the ThorGuard Central Unit.

! *Always use batteries that are identical and ensure that they are fully charged before installation.*

The dimensions of the batteries must not exceed those given in Fig. 3.5.

Fig. 3.5 *Connection of back-up batteries. Please note the maximum dimensions.*



Connection cables

The connection cables for the backup batteries are already mounted on the “Bat+” and “Bat– “ terminals of the “Bat. Charge” connector. The interconnection cable between the batteries is located inside the Central Unit.

Interconnection cable

Find the interconnection cable and open the fuse holder. Remove the fuse to separate the cable into two parts.
Mount one part of the interconnection cable on the positive terminal of one of the batteries (Left-hand battery) and the other part of the cable on the negative terminal of the other battery (Right hand battery).

Left hand battery

Place the left-hand battery with the orientation shown in Fig. 3.5, so that it rests on the edge of the cabinet and the negative terminal is accessible for connection. Mount the negative cable (black) from the “Bat– “ terminal. When done, push the battery carefully in place

Right hand battery

Place the right hand battery with the orientation shown in Fig. 3.5, so that it rests on the edge of the cabinet and the positive terminal is accessible for connection. Mount the positive cable (red) from the “Bat+“ terminal. When done, push the battery carefully in place

Mounting fuse

Ensure that no conductor or cable terminal is in contact with the cabinet before you mount the fuse again.

Setting charging current

The charging current to the battery can be set to either ~1200 mA or ~1800 mA by means of a jumper. See the sections, Setting of jumpers “J1” for version 1.0 on page 3-22 and Setting of jumpers “J1” version 2.0 on page 3-19.

3.2.4 Overview of the ThorGuard Central Unit CPU-board

Fig. 3.6 below shows the layout of the CPU-board indicating the positions of connectors, jumpers, switches, status LEDs and expansion slots No. 1 to No. 4.

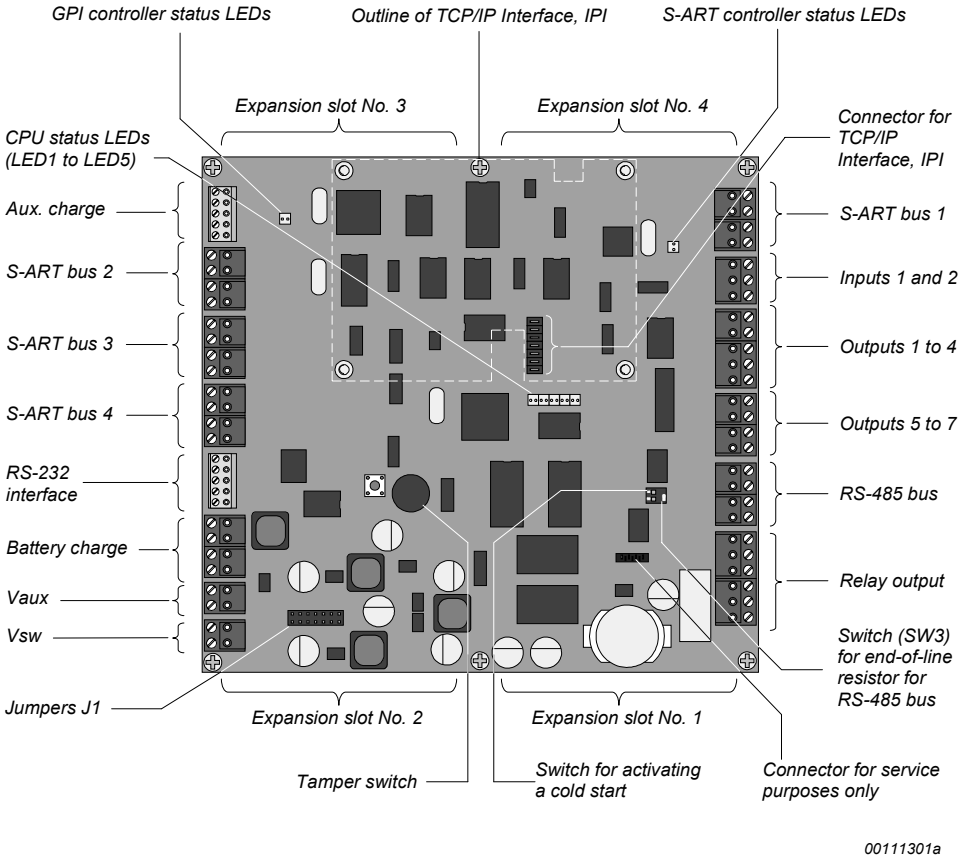
Connections

The connections to be made to the various connectors of the CPU-board are described in the following Sections 3.2.5 to 3.2.8. Installation and connection to the optional TCP/IP Interface, IPI, are described in Section 3.3.

Connector and terminal labels

The labelling of the various connectors and their terminals is situated in front of the connectors.

Fig. 3.6 *Layout of the ThorGuard Central Unit CPU-board.*



Expansion slots

The expansion slots are placed behind the CPU-board between the board and the metal mounting plate. They are equipped with connectors and guide rails. They are used for S-ART 120 Expansion Boards and for various interface boards. Mounting of S-ART 120 Expansion Boards is described in Section 3.6.

S-ART controller status LED

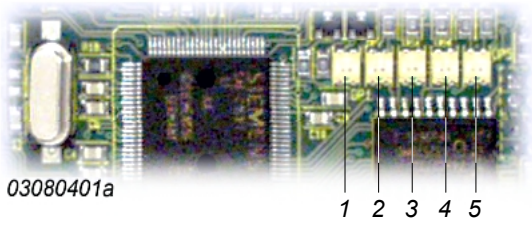
This LED indicates the status of the S-ART-bus controller. When operating correctly, the LED will flash green with a 1 s interval. If *not* OK, the LED will show a steady red light.

GPI controller status LED

This LED indicates the status of the GPI controller. When operating correctly, the LED will flash green with a 1 s interval. If *not* OK, the LED will show a steady red light.

CPU status LEDs

The CPU status LEDs comprise five LEDs shown to the right.
Depending on the state of the ThorGuard Central Unit, they will indicate the following:



State	*Version*	*Indication*
Boot	1.0/1.1*	No indication in LED1 to LED5
	2.0**	LED2: Steady green means that the program saved in FLASH 1 memory is running. LED3: Steady green means that the program saved in FLASH2 memory is running. No indication in LED1, LED4, and LED 5.
Initialization	1.0/1.1*	During the CRC verification of the firmware, LED1 to LED3 is turned on one by one. If the Program saved in FLASH 1 has to be copied into FLASH 2, LED4 and LED5 will be turned on one by one during the process. Before the instantiation of the objects, LED1 to LED5 are all turned on. During the instantiation, LED5 down to LED1 are turned off one by one.
	2.0**	During the CRC verification of the firmware, the LED1 to LED3 is turned on one by one. Before the instantiation of the objects, LED1 to LED5 are all turned on. During the instantiation, LED5 down to LED1 are turned off one by one.
Application running	1.0/1.1* and 2.0**	LED1 is used for indication of system errors. If flashing green once every 2 s, no system error is present. If flashing red once every 2 s, system errors are present.
		LED2 is used for indication interrupt status for the S-ART Controller. If off, there is no pending interrupt from S-ART Controller. If green, there is pending interrupts from S-Art Controller. Note! Only from Version 3.10.XXX of the Flash firmware.
		LED3 is used for test purposes. The operation will depend on version.
		LED4 is used for test purposes. The operation will depend on version.
		LED5 is used for test purposes. The operation will depend on version.

* Stock numbers 400000 and 400043. ** Stock number 400042. See Fig. 3.7

Connector for the IPI TCP/IP Interface

This connector is used for connection of the IPI TCP/IP interface when installed. Without this interface, the connector is bypassed by means of a jumper block. See Section 3.3 for information about installation of the IPI.

!

Please note the IPI TCP/IP interface can only be used in connection with ThorGuard CPU-board version 2.0. See this section, page 3-11.

Aux. power

Connector for connection of power to S-ART 120 Expansion Boards for ThorGuard CPU-board version 2.0 or connection of an auxiliary power supply for ThorGuard CPU-board version 1.0 and 1.1.

Jumpers "J1"

These jumpers are used for selecting charging current, charging current temperature compensation and power supply options. See Section 3.2.7 for more information.

Tamper switch

The CPU-board has an on-board tamper switch.

Connector for service

This connector is only for use by authorized service personnel. It can be used for download of software and for trouble-shooting.

End-of-line resistor and cold start

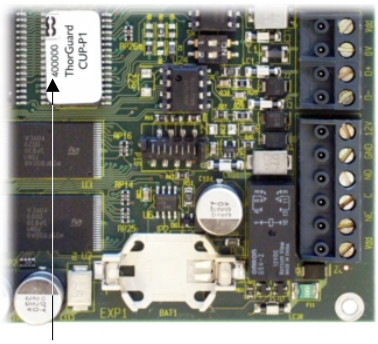
Dual switch for setting on or off the end-of-line resistor of the RS-485 bus (See Section 3.2.6) and for activating a cold start of the ThorGuard Central Unit. See Section 4.1.3 for more information.

ThorGuard CPU-board version

The figure below shows where to locate the stock number of the ThorGuard CPU-board for determining the version of the board.

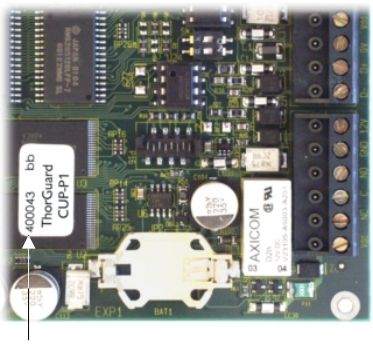
Fig. 3.7 *Location of stock number for identification of version of ThorGuard CPU-board.*

Lower right corner



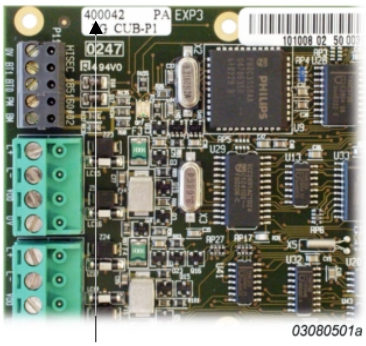
Stock number: 400000
ThorGuard CPU-board, version 1.0

Lower right corner



Stock number: 400043
ThorGuard CPU-board, version 1.1

Upper left corner



Stock number: 400042
ThorGuard CPU-board, version 2.0

The version of the ThorGuard CPU-board determines the function of the CPU status LEDs (This section, page 3-10), the method of power supply to the S-ART 120 Expansion Boards (Section 3.2.7), and whether or not the IPI TCP/IP Interface can be used (Section 3.3). Please refer to these sections for more information.

3.2.5 Connection of inputs and outputs

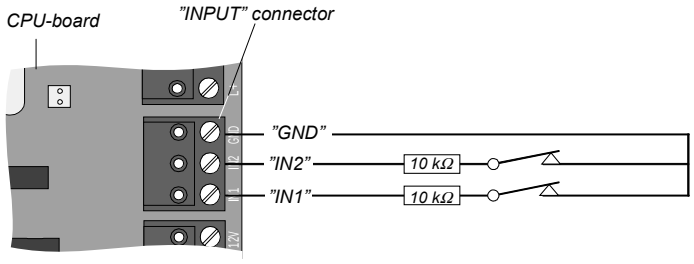
Introduction

This section describes the application and connection of the inputs and outputs of the CPU-board of the ThorGuard Central Unit.

Input terminals

These inputs can be used connection of for example tamper contacts for externally connected devices such as that shown in Fig. 3.10. They are intended for connection of normally closed (NC) contacts, so that the opening of a contact will generate an alarm or sabotage message, depending on the programming of the ThorGuard Central Unit.

Fig. 3.8 *Example of connection of NC contacts to the "IN1" and "IN2" inputs.*



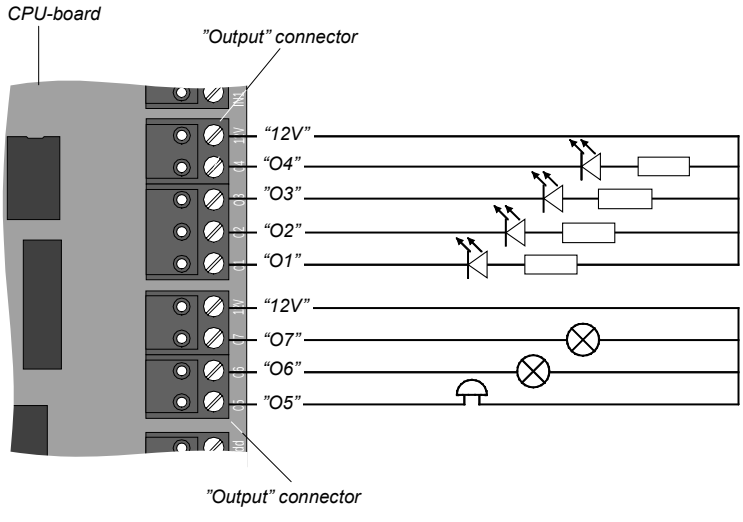
The connector is labelled "P3 INPUT" and has the following screw terminals:

Label	*Description*
"GND"	Ground terminal common for the connected contacts.
"IN2"	Input terminal for a NC contact in series with a 10 kΩ resistor
"IN1"	Input terminal for a NC contact in series with a 10 kΩ resistor

Output terminals

These outputs can be used for connection of LEDs, indicator lamps, acoustical warning devices, etc. The outputs are distributed on two screw terminal connectors.

Fig. 3.9 *Example of connection of LEDs, indicator lamps and acoustical warning devices.*



They are intended for connection of indicators and buzzers, etc. Their function will depend on the on the programming of the ThorGuard Central Unit.

The connectors are both labelled “Output” and have the following screw terminals:

Label	*Description*
“12V”	+ 12 V DC, nominally (14.3 V for 12 V version, 14.4 V for 24 V version).
“O4”	Output for connection of an indicator such as a LED, lamp, buzzer, etc.
“O3”	Output for connection of an indicator such as a LED, lamp, buzzer, etc.
“O2”	Output for connection of an indicator such as a LED, lamp, buzzer, etc.
“O1”	Output for connection of an indicator such as a LED, lamp, buzzer, etc.

Label	*Description*
“12V”	+ 12 V DC, nominally (14.3 V for 12 V version, 14.4 V for 24 V version).
“O7”	Output for connection of an indicator such as a LED, lamp, buzzer, etc.
“O6”	Output for connection of an indicator such as a LED, lamp, buzzer, etc.
“O5”	Output for connection of an indicator such as a LED, lamp, buzzer, etc.

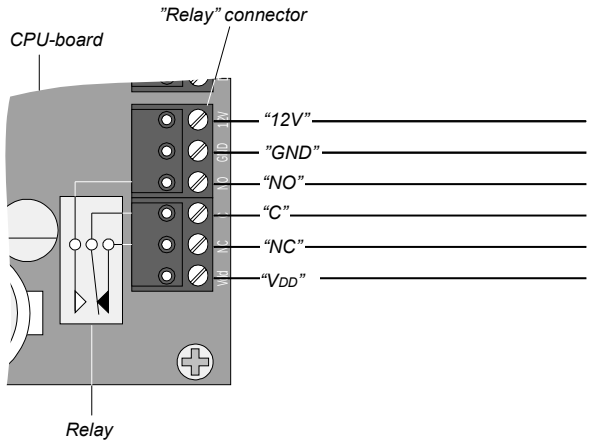
“12V” terminal

The voltage available on the “12V” terminal depends on the version of the ThorGuard Central Unit used. For the 12 V version, the voltage is 14.3 V DC and for the 24 V version, 14.4 V DC.
The maximum total current that can be drawn from all “12V” outputs at the same time is 500 mA.
A resistor may be needed in series with the connected device in order to limit the current.

Relay output terminals

The relay outputs can be used for operating sirens and other acoustical warning devices requiring currents and voltages higher than those delivered from the outputs “O1” to “O7”.

Fig. 3.10 *Terminals of the “Relay” screw terminal connector.*



The relay has a single set of change-over contacts. The maximum switching voltage of the relay is 30 V DC or AC. The maximum contact current is 2 A DC or AC, while the maximum switching power is 60 W or 120 VA.

The actual function of the relay output will depend on the application and the programming of the ThorGuard Central Unit.

The connector is labelled “Relay” and has the following screw terminals:

Label	*Description*
“12V”	+ 12 V DC, nominally.
“GND”	Ground terminal.
“NO”	Normally open relay contact (NO).
“C”	Common relay contact.
“NC”	Normally closed relay contact (NC).
“Vdd”	+ 12 V DC or + 24 V DC, nominally.

“12V” terminal

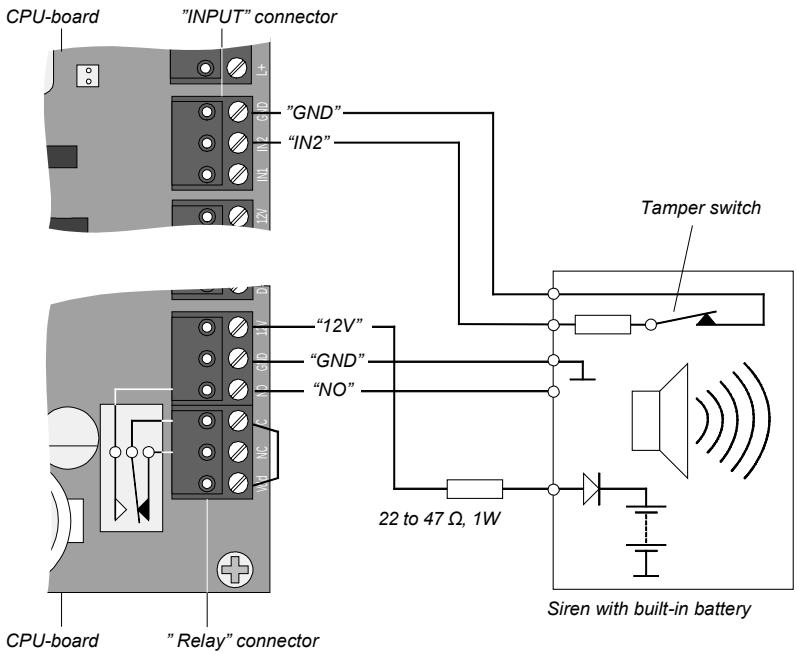
The voltage available on the “12V” terminal depends on the version of the ThorGuard Central Unit used. For the 12 V version, the voltage is 14.3 V DC and for the 24 V version, 14.4 V DC.
Please note that the output current is limited to 100 mA. If a battery is connected to this terminal, it should be with a 22 to 47 Ω resistor in series. See Fig. 3.11.

“Vdd” terminal

The voltage available on the “Vdd” terminal is depends on the version of the ThorGuard Central Unit used. For the 12 V version, the voltage is 14.3 V DC and for the 24 V version, 28.3 V DC.

The example below shows the connection of a siren with built-in battery connected to the relay output of the ThorGuard Central Unit. The built-in battery of the siren is recharged from the “Vdd” terminal. The tamper switch is connected between the “GND” and “IN2” terminals of the “INPUT” connector.

Fig. 3.11 *Example of connection of the connection of a siren to the “Relay” connector.*

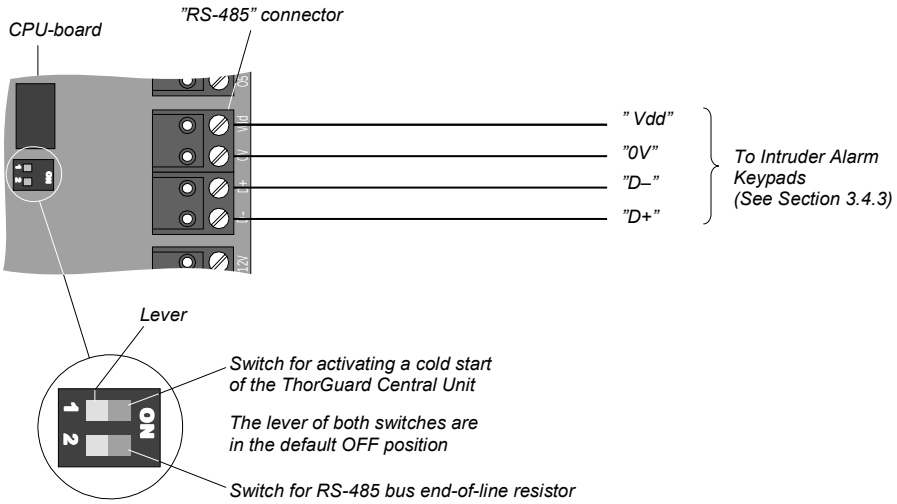


3.2.6 Connection of RS-485 bus

The RS-485 bus is used for communication between the ThorGuard Central Unit and the installed Intruder Alarm Keypads RKP and RKP-E.

See Section 3.4.3 for connection of RKP and RKP-E to the RS-485 bus.

Fig. 3.12 *Example of connection of the RS-485 bus to the "RS-485" connector.*



The connector is labelled "RS485" and has the following screw terminals:

Label	*Description*
"D+"	Data
"D–"	Data
"0V"	Common ground for D+ and D– and the power supply for connected units.
"Vdd"	+ 12 V DC or + 24 V DC, nominally.

"Vdd"

The voltage available on the "Vdd" terminal is depends on the version of the ThorGuard Central Unit used. For the 12 V version, the voltage is 14.3 V DC and for the 24 V version, 28.3 V DC.

End-of-line resistor

The switch (SW3) contains two switches labelled "1" and "2". Switch "2" is the end-of-line resistor switch while switch "1" is used for activating a cold start of the ThorGuard Central Unit.

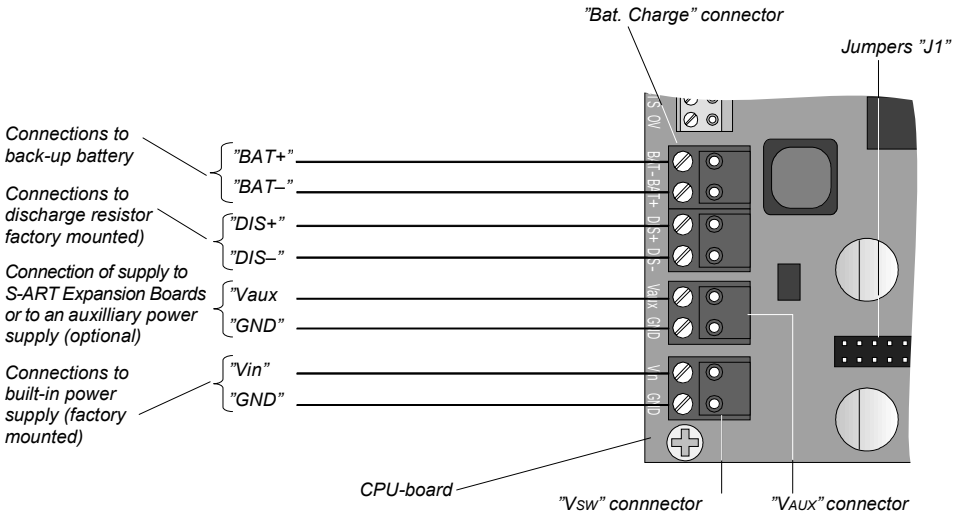
Switch "1" should normally be in its OFF position, while switch "2" should be set in accordance with the position of the ThorGuard Central Unit on the RS-485 bus. See Section 3.4.3 for more information.

3.2.7 Battery and power connections

The battery and power connectors of the CPU-board comprise the following:

- "Batt. Charge" connector for connection of backup battery and discharge power resistor.
- "VSW" connector for connection of DC power from the built-in power supply below the CPU-board.
- "Vaux" connector for connection of power (Vdd) to S-ART 120 Expansion Boards for ThorGuard CPU-board version 2.0
  or
  connection of an auxiliary power supply for ThorGuard CPU-board version 1.0 for systems with a large current consumption from detectors, acoustical warning devices, Intruder Alarm Keypads, etc.
- "AUX. CHARGE" connector for connection of an auxiliary power supply with battery charger.

Fig. 3.13 *Battery and power supply connections for ThorGuard CPU-board version 2.0.*



"Batt. Charge" connector

The connector is labelled "Batt. Charge" and has the following screw terminals:

Label	*Description*
"BAT+"	Connected to the positive terminal of the backup battery. See also Section 3.2.3.
"BAT–"	Connected to the negative terminal (Ground) of the backup battery. See also Section 3.2.3.
"DIS+"	Connected to the discharge power resistor. Factory mounted.
"DIS–"	

The charging current to the back-up battery can be set to either 1200 mA or 1800 mA. See the sections, Setting of jumpers "J1" for version 1.0 on page 3-22 and Setting of jumpers "J1" version 2.0 on page 3-19.

"VSW" connector

The connector is labelled "P8 Vsw" and is used for supplying onboard power. It has the following screw terminals:

Label	*Description*
"Vin"	Connected to the positive DC power terminal on the power supply below the CPU-board. Factory mounted.
"GND"	Connected to the negative DC power terminal (Ground) on the power supply below the CPU-board. Factory mounted.

"VAUX" connector

The connector is labelled "Vaux". Its use depends on the version of the ThorGuard CPU-board as follows:

Version 1.0	Connection of an auxiliary power supply for systems with a large current consumption. Requires setting of jumpers as described on page 3-22.
Version 1.1	The "Vaux"connector is not used in this version.
Version 2.0	Connection of power for the optional S-ART 120 Expansion Boards when one or more have been mounted. Requires no special setting of jumpers.

☛ For identification of the version of the ThorGuard CPU-board, see page 3-11.

"VAUX" connector on CPU-boards version 1.0

The connector is labelled "Vaux" and is used for connection of an auxiliary power supply if you want to supply a higher current to the terminals labelled "Vdd", "12 V" than that available from the built-in power supply. See page 2-7 for more information about the current that can be supplied via the "Vaux" terminals.

When an auxiliary power supply is connected, the built-in power supply is used for supply of operating current to the Central Unit Board and supply of charging current. This requires another setting of the jumpers "J1" than the default setting. See the Section, Setting of jumpers "J1" for version 1.0 on page 3-22.

The "Vaux" connector has the following screw terminals:

Label	*Description*
"Vaux"	"Vaux" connector for connection of an auxiliary power supply (+).
"GND"	"Vaux" connector for connection of an auxiliary power supply. (Ground)

Please note that if an auxiliary power supply used, it must have its own battery back-up.

"VAUX" connector on CPU-boards Version 2.0

"Vaux" may receive power from either a "Vdd" terminal on one of the connector blocks on the ThorGuard CPU-board or from an auxiliary power supply if the current available from a "Vdd" terminal is insufficient.

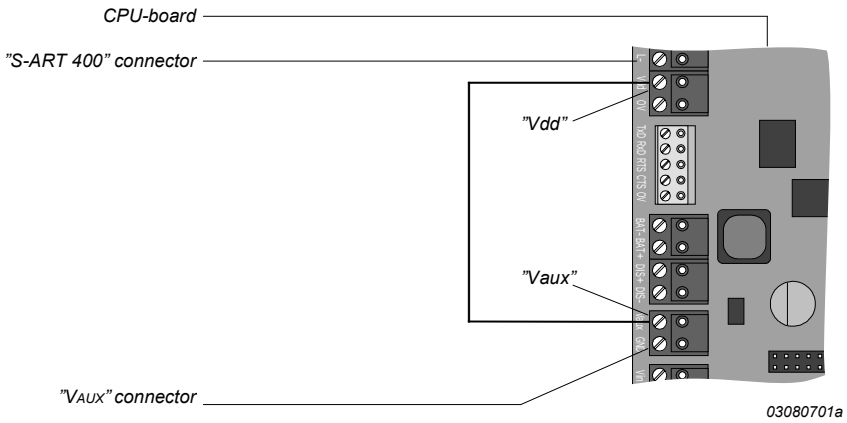
Supply from "Vdd"

If you choose to supply the power to "Vaux" from one of the "Vdd" terminals, you must ensure:

- that the total current drawn from the "Vdd" terminals on the installed S-ART 120 Expansion Boards does not exceed the limit set by the fuse.
- that the total current drawn from all "Vdd" terminals on the CPU-board as well as on the installed S-ART 120 Expansion Boards does not exceed the limit. See page 2-7 for more information.

The block diagram on page 3-21 shows the fuse rating for the available "Vdd" terminals.

Fig. 3.14 *Example of connection of power to the S-ART 120 Expansion Boards for a CPU-board version 2.0 using the "Vdd" terminal from one of the on-board S-ART buses.*



Auxiliary supply

When an auxiliary power supply is used for supply of power to installed S-ART 120 Expansion Boards, connection to the terminals of the "Vaux" connector is completed as follows:

Label	*Description*
"Vaux"	"Vaux" connector for connection to an auxiliary power supply (+).
"GND"	"Vaux" connector for connection to an auxiliary power (Ground).

Please note that the auxiliary power supply used must have its own battery back-up.

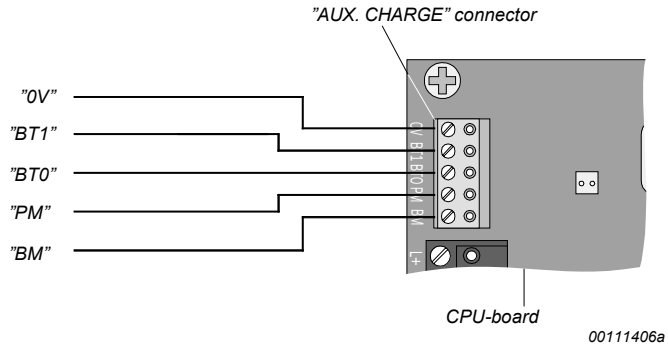
!

Please note that the auxiliary power supply must have the same output voltage as the built-in power supply of the ThorGuard central Unit. This is 15 V DC for the 12 V version and 29 V DC for the 24V version.

"AUX CHARGE" connector

No connections should be made to the "AUX. CHARGE" connector in this application of the CPU-board.

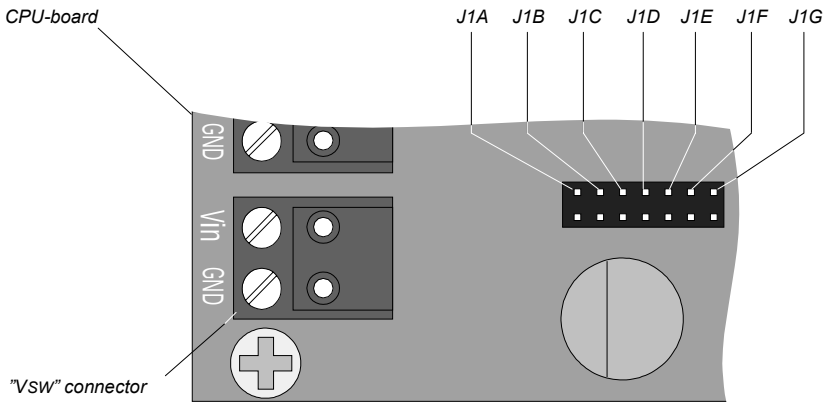
Fig. 3.15 *Screw terminal labels of the "AUX. CHARGE" connector*



Setting of jumpers “J1” version 2.0

The jumpers J1B to J1D and J1G of “J1” (Fig. 3.16) are used for selection of power supply options, temperature compensation and charging current.
The jumper position *J1A* is currently *not used* for version 2.0 of the ThorGuard CPU-board.

Fig. 3.16 *Position of jumpers “J1”. No jumpers are mounted.*



Default jumper positions

When delivered from the factory, the “J1” jumpers are as default set as shown in the table below.

ThorGuard Central Unit version	***J1A***	***J1B***	***J1C***	***J1D***	***J1E***	***J1F***	***J1G***
	Not used	*Voltage on “12 V” terminals*		*Temperature compensation*		*Charging current*	
12 V	-	ON	OFF	ON	OFF	ON	ON
24 V	-	OFF	ON	ON	OFF	ON	ON

The default setting of the jumpers will provide the following values:

ThorGuard Central Unit version	*Voltage on “12 V” terminals*	*Temperature compensation*	*Charging current*
12 V	14.3 V	Internal	1800 mA
24 V	14.5 V	Internal	1800 mA

Jumpers J1B and J1C

The voltage on the “Vdd” terminals will always be equal to the voltage from the power supply (Vsw) minus the voltage drop across the diode. This corresponds to 14.3 V DC for the 12 V version and 28.3 V DC for the 24 V version.

The voltage on the “12 V” terminals will be equal to the voltage from the power supply (Vsw) minus the voltage drop across the diode i.e. 14.3 V DC for the 12 V version and 28.3 V DC for the 24 V version when the JP1B jumper is ON and the JP1C jumper is OFF.
For the 24 V version of the ThorGuard Central Unit, the voltage on the “12 V” terminals will be 14.5 V with the JP1B jumper OFF and the JP1C jumper ON.

! *Please note that the jumpers JP1B and JP1C must not both be ON at the same time. If J1B is OFF, J1C must be ON or vice versa.*

! *Please note that if you change the default setting of the jumpers J1C (OFF) and JD1 (ON) for the 24 V version to J1C (ON) and JD1 (OFF), a voltage of 28.3 V DC will be supplied to the "12 V" terminals.*

Jumpers JP1D and JP1E

The jumpers JP1D and JP1E are used for setting whether internal or external temperature compensation for the charging current should be applied.
When JP1D is ON and JP1E is OFF, internal temperature compensation is applied. When JP1D is OFF, external temperature compensation is applied. External temperature compensation is used when the batteries are situated away from the ThorGuard CU board for example in another cabinet. In that case, it is required to connect a NTC resistor on the terminals for jumper J1E and place this resistor together with the batteries. The NTC resistor used must have a resistance of 4.7 kΩ, 5%, with $B_{75/100}$ = 3530 K.

Jumpers JP1F and JP1G

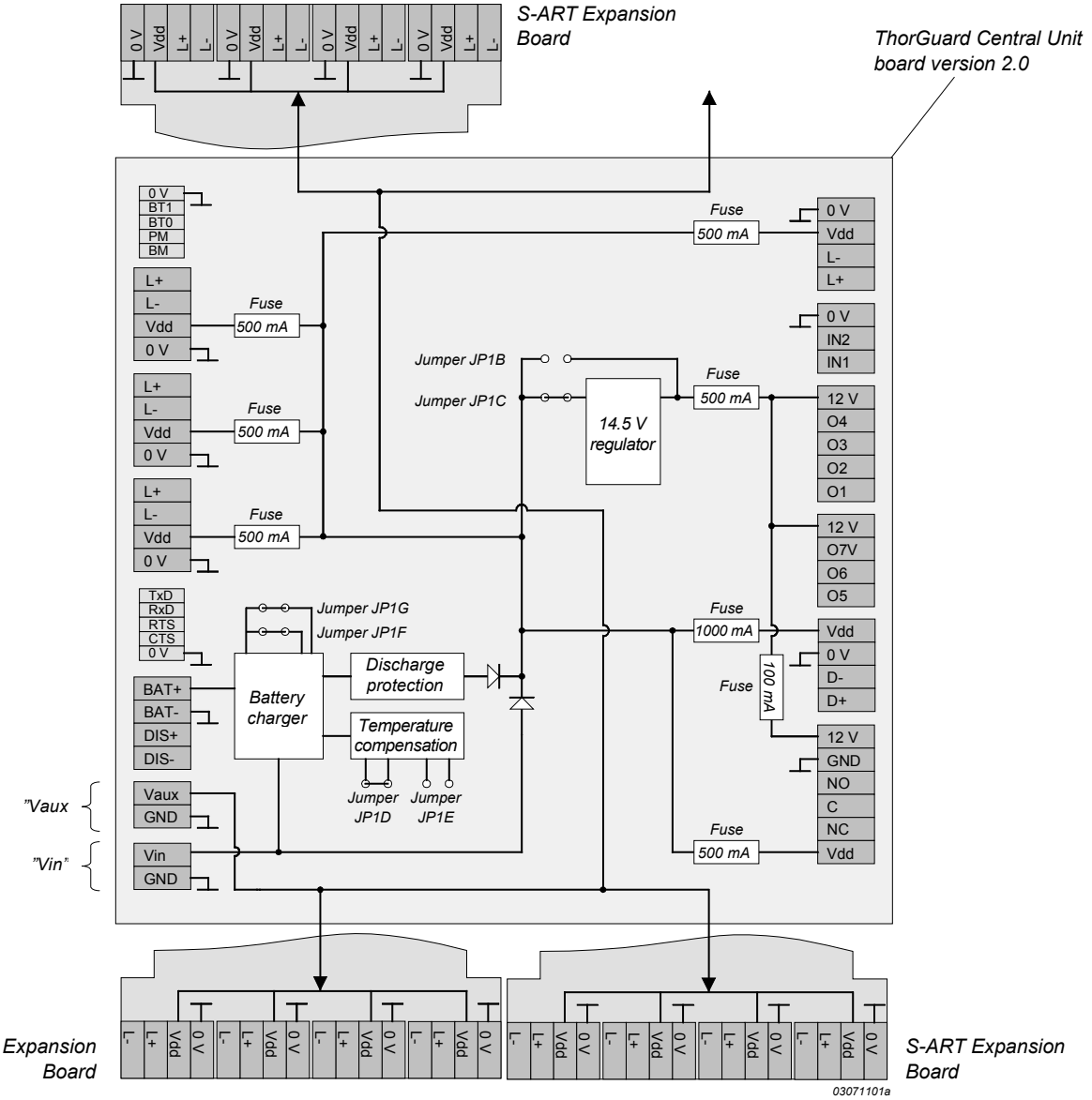
The jumpers JP1F and JP1G are used for setting the charging current. With both jumpers OFF, the charging current is 1200 mA; with both jumpers ON, the charging current is 1800 mA. This is valid for both the 12 V and the 24 V versions of the ThorGuard Central Unit.

! *Please note that J1F and J1G must always both be ON or both be OFF.*

Block diagram

The block diagram below shows the power supply structure and fuses of the ThorGuard CPU-board version 2.

Fig. 3.17 *Block diagram showing the power supply options of the "12 V" and "Vdd" terminals of the ThorGuard Central Unit board version 2.0 and the battery charge options that can be achieved by means of jumper setting.*



Setting of jumpers “J1” for version 1.0

The jumpers J1A to J1D and J1G of “J1” (Fig. 3.16) are used for selection of power supply options in connection with an auxiliary power supply connected to the “Vaux” connector and setting of the charging current for the back-up battery. The jumper position *J1F* is currently *not used*.

Default jumper positions

When delivered from the factory, the “J1” jumpers are set as shown in the table below. This default setting assumes that no auxiliary power supply is used.

ThorGuard Central Unit version	*J1A*	*J1B*	*J1C*	*J1D*	*J1E*	*J1F*	*J1G*
12 V	OFF	ON	ON	OFF	OFF	-	ON
24 V	OFF	ON	OFF	ON	OFF	-	ON

The default setting of the jumpers will provide the following values:

ThorGuard Central Unit version	*Voltage on “12 V” terminals*	*Charging current*
12 V	14.3 V	1800 mA
24 V	14.5 V	1800 mA

Jumpers J1A and J1B

The setting of jumpers J1A and J1B controls whether the voltage for the Vdd”, “12 V” terminals is supplied from the built-in power supply (“VSW” connector) or from an auxiliary power supply (“VAUX” connector).

The default setting of J1A (OFF) and J1B (OFF) is used when only the built-in power supply is connected. This setting will provide a voltage for the “Vdd” terminals of 14.3 V DC for the 12 V version and 28.3 V DC for the 24 V version. The voltage on the “12 V” terminals will depend on the setting of the jumpers J1C and J1D.

With an auxiliary power supply connected to the “VAUX” connector, the built-in power supply will supply operating current to the CPU-board and charging current while the auxiliary power supply will supply the “Vdd” and “12 V” terminals. This is done by changing the setting of jumper J1A to ON and the jumper J1B to OFF.

! *Please note that the jumpers J1A and J1B must not both be ON at the same time. If J1A is OFF, J1B must be ON or vice versa.*

Jumpers J1C and J1D

The setting of jumpers J1C and JD1 controls the voltage on the “12 V” terminals.

If you are using the 12 V version, the jumper J1C should be set ON and the jumper and JD1 OFF (default setting). If you are using an auxiliary supply for the 12 V version, you can keep this setting if the auxiliary supply has an output voltage that does not exceed 15 V. If the voltage exceeds 15 V, you must set the jumpers J1C to OFF and the jumper JD1 to ON. This will provide a voltage of 14.3 V DC for the “12 V” terminals.

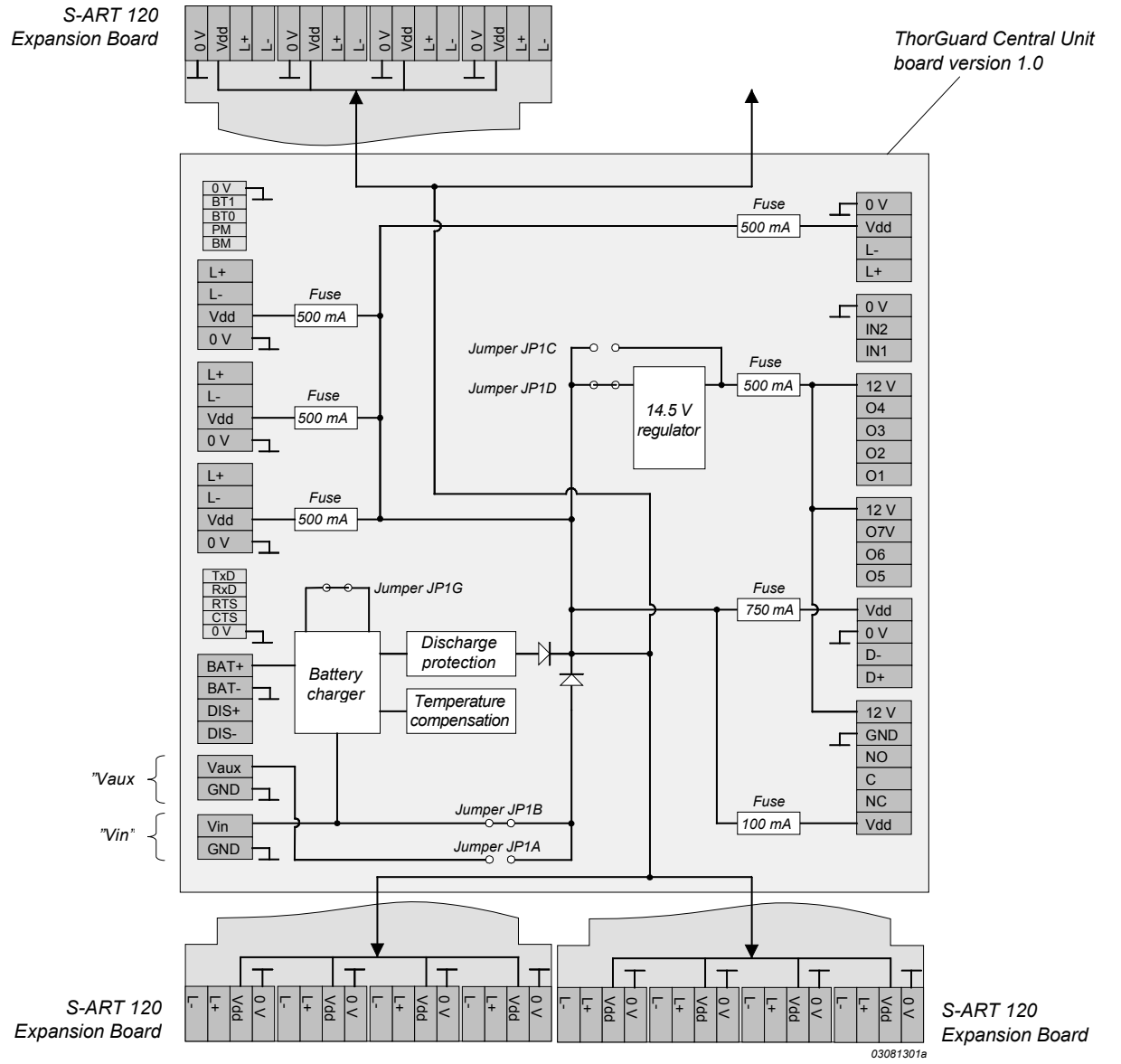
For the 24 V version, you should keep the default setting of the jumpers J1C (OFF) and JD1 (ON) both when using the built-in power supply and an auxiliary power supply. This will provide a voltage of 14.4 V DC for the “12 V” terminals.

! *Please note that if you change the default setting of the jumpers J1C (OFF) and JD1 (ON) for the 24 V version to J1C (ON) and JD1 (OFF), a voltage of 28.3 V DC will be supplied to the “12 V” terminals.*

Block diagram

The block diagram below shows the power supply structure and fuses of the ThorGuard CPU-board version 1.0.

Fig. 3.18 *Block diagram showing the power supply options of the "12 V" and "Vdd" terminals of the ThorGuard Central Unit board version 1.0 and the battery charge options that can be achieved by means of jumper setting.*



Jumper J1E

The jumper position *J1E* is must currently *not be used*. The jumper must be OFF.

Jumper J1F

The jumper position *J1F* is currently *not used*. The jumper may be ON or OFF.

Jumper J1G

The jumper J1G is used for setting the charging current. With the jumper OFF, the current is 1200 mA; with the jumper ON, the current is 1800 mA. This is valid for both the 12 V and the 24 V versions of the ThorGuard Central Unit.

Setting of jumpers “J1” for version 1.1

The jumpers J1C and J1D of “J1” (Fig. 3.16) are used for selection of power supply options for the “12 V” terminals. The jumper J1B must always be mounted. The jumper positions *J1A*, *J1E*, *J1F* and *J1G* are *not used* in this version.

Default jumper positions

When delivered from the factory, the “J1” jumpers are set as shown in the table below. This default setting assumes that no auxiliary power supply is used.

ThorGuard Central Unit version	***J1A***	***J1B***	***J1C***	***J1D***	***J1E***	***J1F***	***J1G***
12 V	-	ON	ON	OFF	-	-	-
24 V	-	ON	OFF	ON	-	-	-

The default setting of the jumpers will provide the following values:

ThorGuard Central Unit version	*Voltage on “12 V” terminals*
12 V	14.3 V
24 V	14.5 V

Jumpers J1C and J1D

The setting of jumpers J1C and JD1 controls the voltage on the “12 V” terminals.

If you are using the 12 V version, the jumper J1C should be set ON and the jumper and JD1 OFF (default setting).
For the 24 V version, you should keep the default setting of the jumpers J1C (OFF) and JD1 (ON) to provide a voltage of 14.4 V DC for the “12 V” terminals.

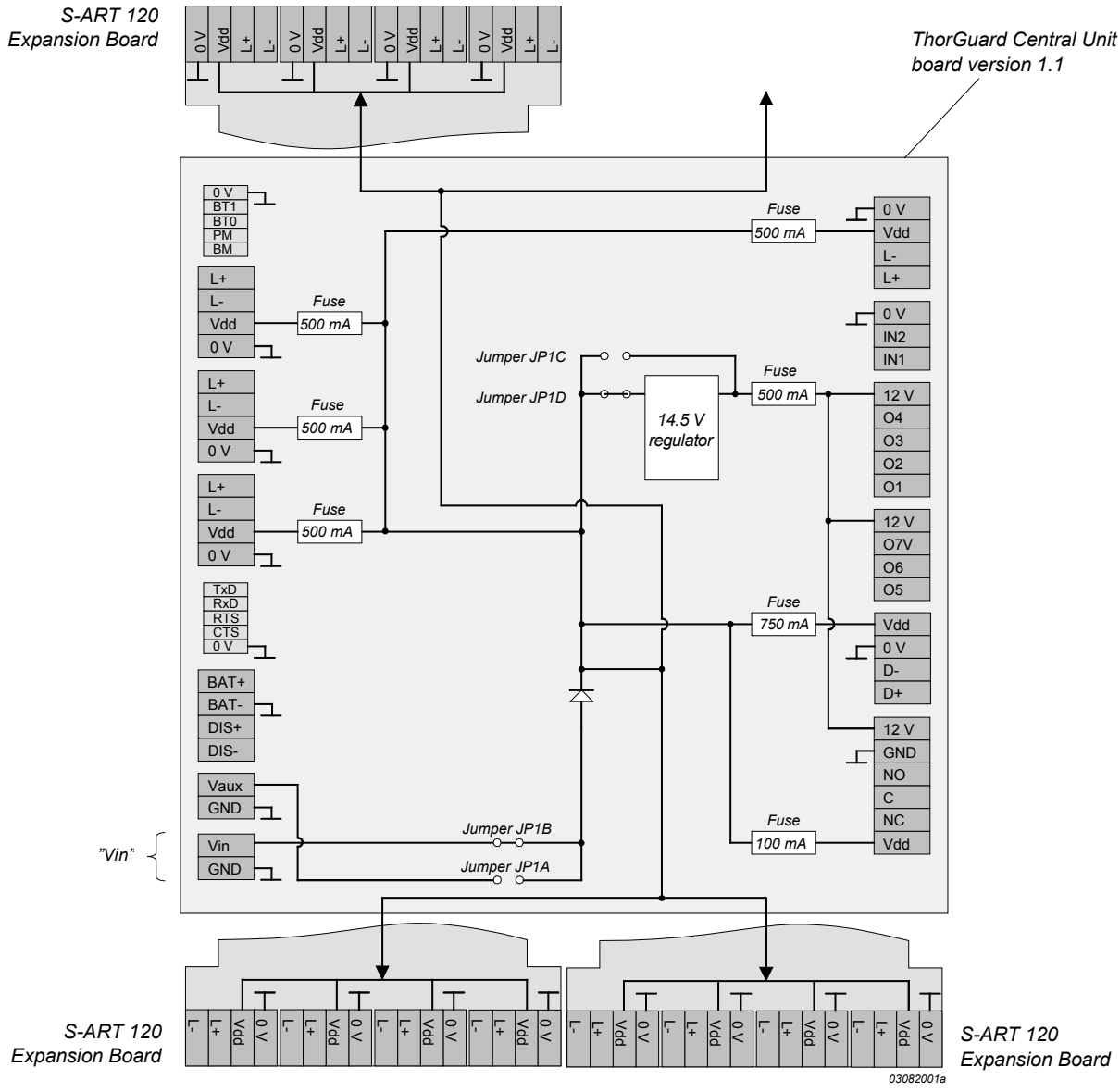
! *Please note that if you change the default setting of the jumpers J1C (OFF) and JD1 (ON) for the 24 V version to J1C (ON) and JD1 (OFF), a voltage of 28.3 V DC will be supplied to the “12 V” terminals*

Please note that if you change the default setting of the jumpers J1C (OFF) and JD1 (ON) for the 24 V version to J1C (ON) and JD1 (OFF), a voltage of 28.3 V DC will be supplied to the “12 V” terminals.

Block diagram

The block diagram below shows the power supply structure and the fuses of the ThorGuard CPU-board version 1.1.

Fig. 3.19 *Block diagram showing the power supply options of the "12 V" terminals of the ThorGuard Central Unit board version 1.1 that can be achieved by means of jumper setting.*



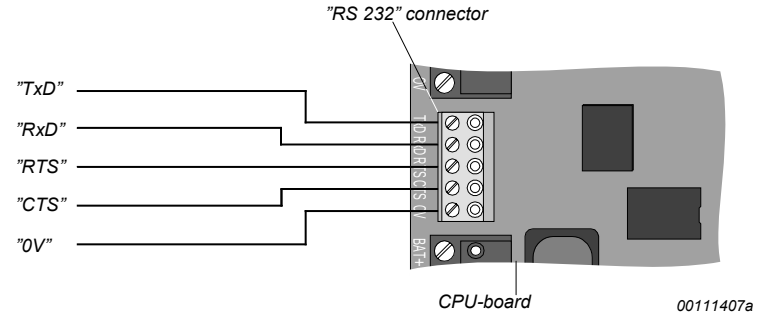
3.2.8 Connection to the RS-232 interface

The RS-232 serial port can have different functions such as:

- PC interface
- printer interface
- modem and X28 interface
- interface to the TCP/IP interface IPI
- interface to a SECOM alarm transmitter.

The function is set during the configuration of the ThorGuard Central Unit.

Fig. 3.20 *Example of the connection of the RS-232 interface.*



The connector is labelled “RS232” and has the following screw terminals:

Label	*Description*
“TxD”	Transmit Data
“RxD”	Receive Data
“RTS”	Request To Send
“CTS”	Clear To Send
“0V”	Ground

Specifications for the RS-232 interface can be found in Section 2.2.1.

3.3 Installation of TCP/IP interface IPI

☛ Please note the IPI TCP/IP interface can only be used in connection with ThorGuard CPU-board version 2.0. See page 3-11.

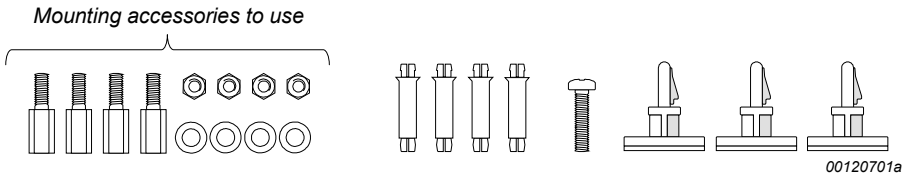
Introduction

The TCP/IP interface IPI is delivered with a mounting kit of which only the four metal stays with associated nuts and washers are used for its mounting on the CPU-board of the ThorGuard Central Unit.

The CPU-board is equipped with a male connector for easy connection of the IPI. The connector is equipped with a jumper block to be removed before mounting the IPI.

The installation, comprising mounting, connection and setting of jumpers, is described in the following sections. More information about the TCP/IP interface IPI can be found in Section 2.2.7. Setup of the IPI is described in the Installation instructions, TCP/IP Interface IPI, Reference No. 94000401.

Fig. 3.21 *Mounting accessories supplied with the IPI.*



3.3.1 Mounting

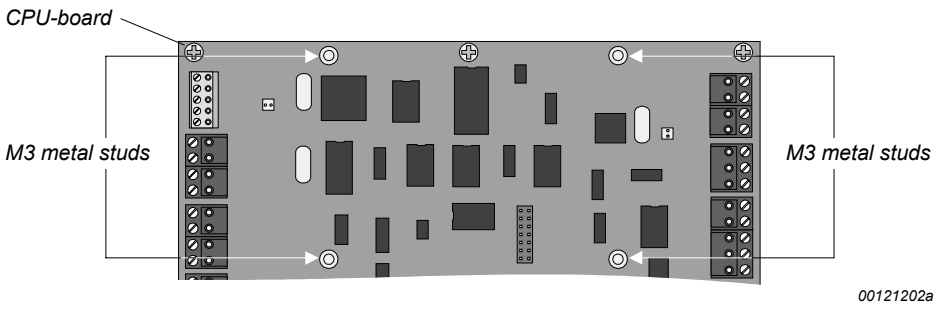
The mounting of the IPI comprises the mounting of the metal stays on the CPU-board followed by the mounting of the IPI on the CPU-board.

Preparing the CPU-board

To prepare the CPU-board board for mounting of the IPI, proceed as follows:

Step	*What to do …*
1	Locate the four metal stays indicated in Fig. 3.21 and screw them onto the M3 metal studs indicated in Fig. 3.22
2	Remove the seven-jumper block on the male connector for the IPI.
3	Continue with step 1 of the procedure of the next paragraph.

Fig. 3.22 *Position of the M3 metal studs on the CPU-board indicated with arrows.*

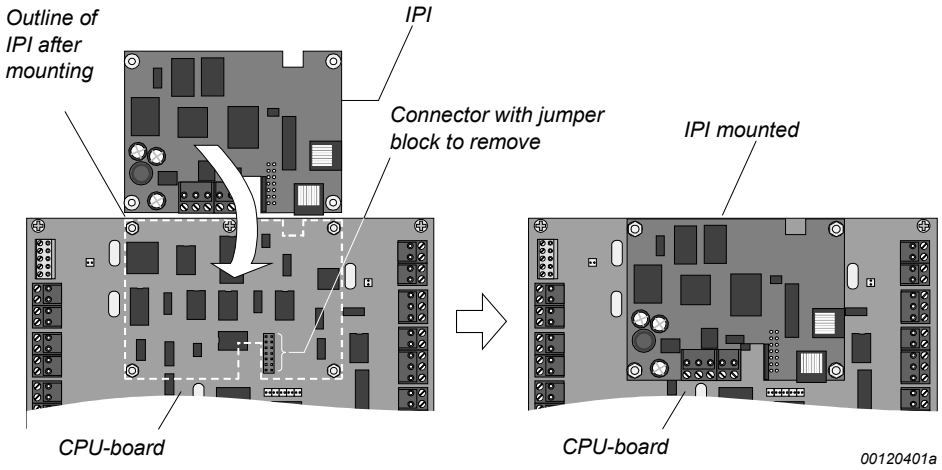


Mounting the IPI

To mount the IPI board, proceed as follows with reference to Fig. 3.23:

Step	*What to do …*
1	Orient the IPI board as shown with the component side facing you.
2	Place the IPI board as indicated with the dotted outline, so that its female connector can engage the male connector of the CPU-board.
3	Push the IPI board towards the CPU-board, so that the connectors engage fully and so that the four M3 stays on the CPU-board engage the corresponding holes in the IPI.
4	Locate the M3 nuts and washers (Fig. 3.21). Put the washers on the M3 stays and screw the M3 nuts on the M3 stays.
5	The IPI is now mounted and is ready for connection to LAN/WAN and setting of jumpers as described in Section 3.3.2.

Fig. 3.23 *Mounting of the IPI on the CPU-board.*



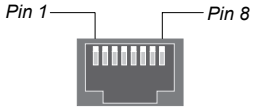
3.3.2 Connection and setting of jumpers

RJ 45 connectors

The IPI is equipped with two RJ 45 sockets (A and B) accepting a RJ 45 plug. In this application, you should use socket A. See Fig. 3.24 on the following page.

The pin configuration of both sockets is the same and is shown in the table below.

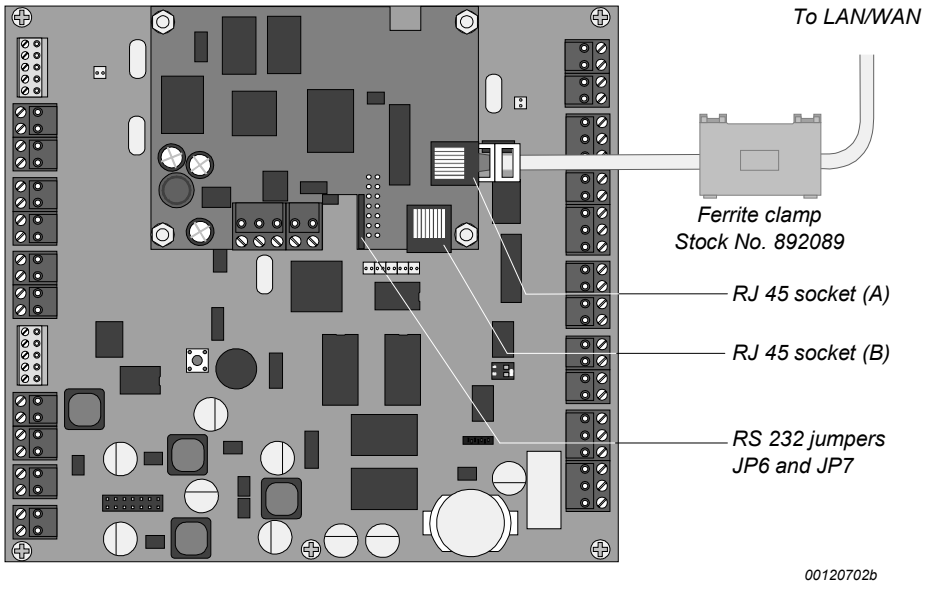
Pin configuration

Pin	*Signal*	*Pin*	*Signal*	*Pin positions, front view*
1	TXD+	5	Not connected	
2	TXD-	6	RXD-	
3	RXD+	7	Not connected	
4	Not connected	8	Not connected	

Cable

The cable to use with the RJ45 connector can be shielded or unshielded cable according to Category 5. The dimension should be 0.32 mm (0.08 mm²). The length should not exceed 100 m.

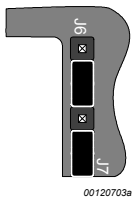
Fig. 3.24 *Connection of the IPI. Please note that a ferrite clamp, stock No. must be installed on the cable to the LAN/WAN.*



RS-232 jumpers

The setting of the RS-232 jumpers “J6” and “J7” is determined by the application of 95T IPI.
For this particular application, the jumpers should be set as shown to the right.

For the position of the jumpers, please refer to Fig. 3.24, above.



3.4 Installation of RKP and RKP-E

Introduction

This section describes the mounting of the Intruder Alarm Keypads RKP and RKP-E and their connection to the RS-485 bus.

Mounting height of RKP and RKP-E

The RKP and RKP-E should be mounted in a height that makes it easy to watch the display and to operate the Intruder Alarm Keypad. This will in most cases be fulfilled with a mounting height of 150 to 160 cm to the top of the RKP or RKP-E.

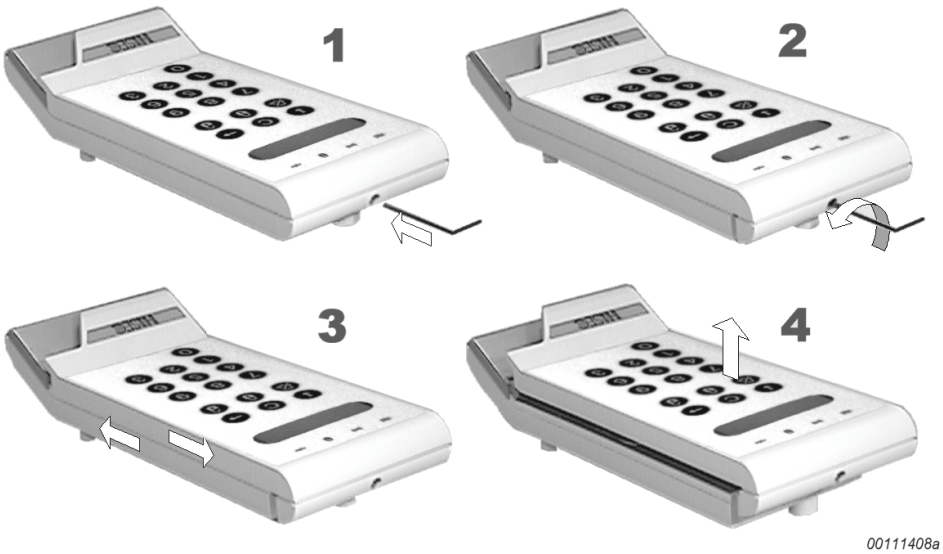
3.4.1 Mounting the of RKP

Removing front cover of RKP

Before you can mount and connect the Intruder Alarm Keypad RKP, you must remove its front cover. Locate the locking screw on the top of the RKP and follow the instructions below, referring to Fig. 3.25:

Step	*What to do …*
1	Insert a 2.5 mm Allen key in the locking screw in the top of the RKP.
2	Turn the key counterclockwise 8 to 10 turns to release the locking screw completely. The locking screw cannot be removed; it is retained in the cover.
3	Push the front cover and the case in the directions shown by the arrows until they are disengaged.
4	Lift the cover and disconnect the flat-cable between the Intruder Alarm Keypad and the circuit board taking care not to damage the cable and the connector. Do not use the cable for pulling off the connector
5	Remove the front cover completely.

Fig. 3.25 *How to remove the front cover of the Intruder Alarm Keypad RKP.*

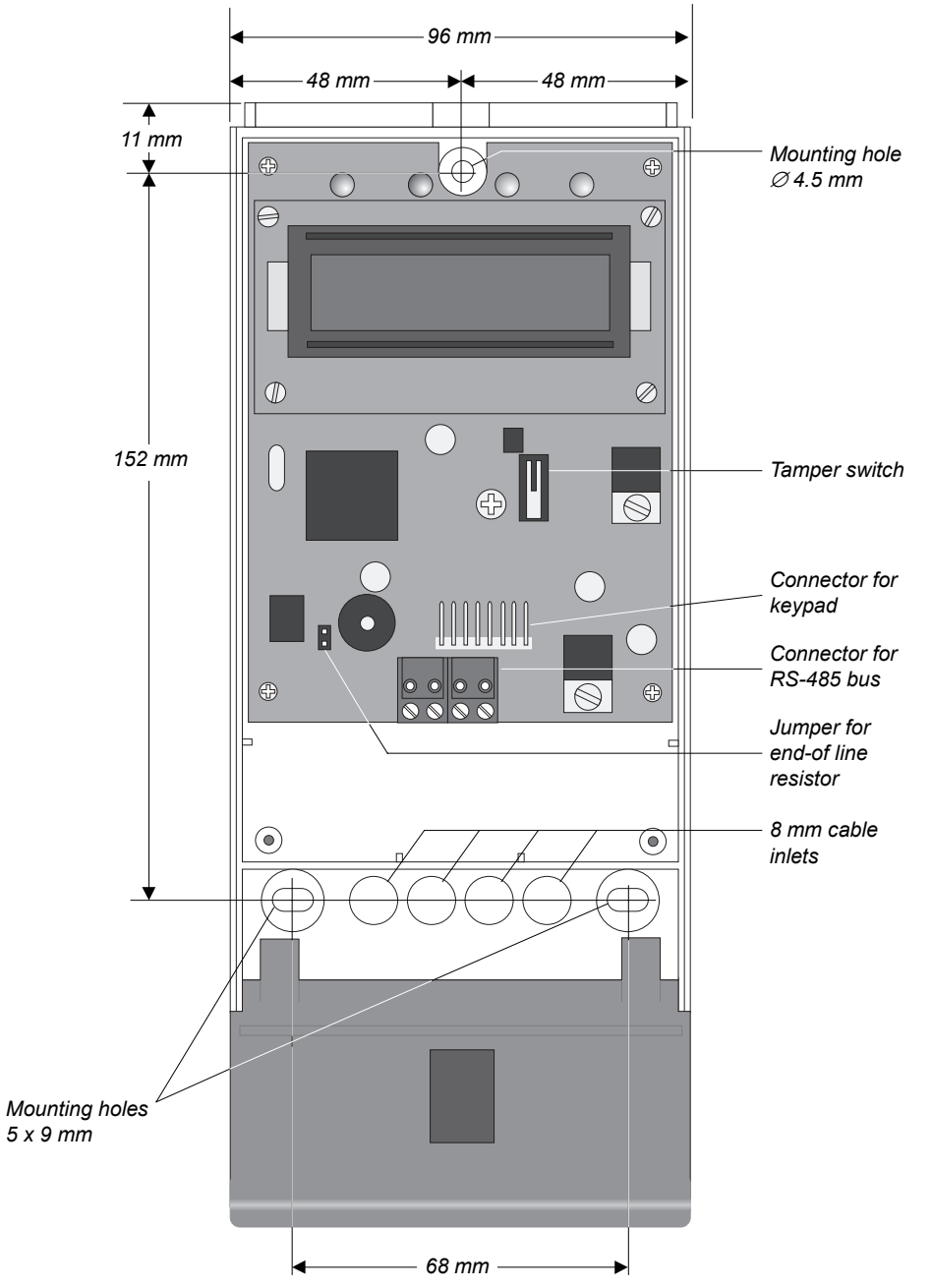


You can now mount the RKP as described in the following section. If you want to set the jumper for the end-of-line resistor, please refer to Section 3.4.3.

Mounting of RKP

The RKP has three mounting holes placed as shown in Fig. 3.26. Screws for mounting should have a diameter of 3.5 to 4 mm with a length to suit the mounting method.

Fig. 3.26 *Layout of the RKP showing position of mounting holes, cable inlets, connectors and jumper for end-of-line resistor.*



00111410a

Cable inlets of RKP

The RKP has four 8 mm cable inlets as shown in Fig. 3.26. When mounted, there is approx. 8 mm of space behind the RKP for entry of cables. Cables of minimum dimensions can normally be inserted after the RKP has been mounted.

However, if heavy cables are used, it may be necessary to loosen the mounting screws before inserting the cables. If so, you must ensure that there is sufficient

space between the RKP and the surface for the cables, so that you do not distort the RKP when you tighten the mounting screws.

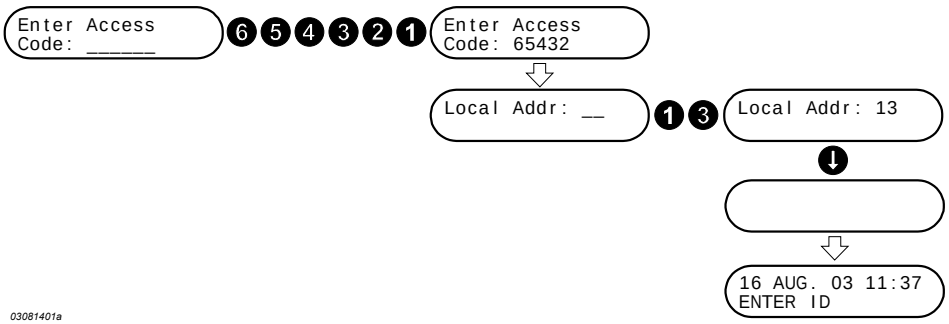
Ending the installation

After you have mounted the RKP, connected it to the RS-485 bus (See Section 3.4.3), and set the jumper for the end-of-line resistor, you can connect the flat-cable between the keypad and the circuit board taking care not to damage the cable and the connector. Then replace the cover and tighten its locking screw.

Address setting

The address on the RS-485 bus used by the RKP must be programmed during power-up of the unit. As soon as power is switched on to the RKP, the display prompts for the code that gives access to set the address. Enter the fixed code `654321` using the numeric keyboard.
When the code has been entered, the display prompts for the address. Enter this address – for example `13` - and press the ⬇ button. The display is blanked and after a few seconds, it shows the current date and prompts for entry of a PIN-code.

Fig. 3.27 *Example of the setting of the address on the RS-485 bus.*



☛ Please note that the address range is from 01 to 31 (Address 00 is used by the ThorGuard Central Unit) and that addresses always must consist of two digits – for example `06` – for the address 6.

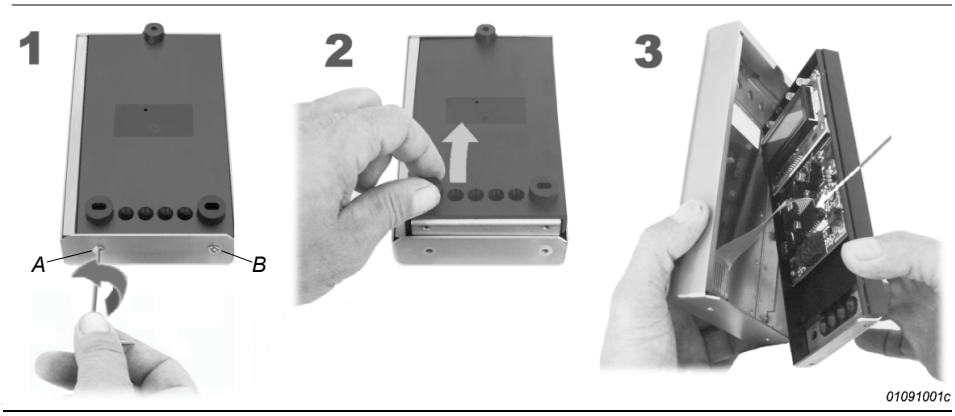
3.4.2 Mounting of the RKP-E

Removing front cover of RKP

Before you can mount and connect the Intruder Alarm Keypad RKP-E, you must remove its front cover.
Locate the locking screws of the RKP-E and follow the instructions below, referring to Fig. 3.28:

Step	*What to do …*
1	Place the RKP-E with the rear part upward and the screws facing you. Remove the two screws A and B, using a 2.5 mm Allen key.
2	Lift the rear part from the front part and separate them slightly not to damage the flat cable connecting the front and rear parts
3	Locate the keypad connector – indicated by the arrow – and remove the connector from the terminal. Do not use the cable for pulling off the connector.
4	Remove the rear part completely.

Fig. 3.28 *How to remove the front cover of the Intruder Alarm Keypad RKP-E.*



You can now mount the RKP-E as described in the following section. If you want to set the jumper for the end-of-line resistor, please refer to Section 3.4.3.

Mounting of RKP-E

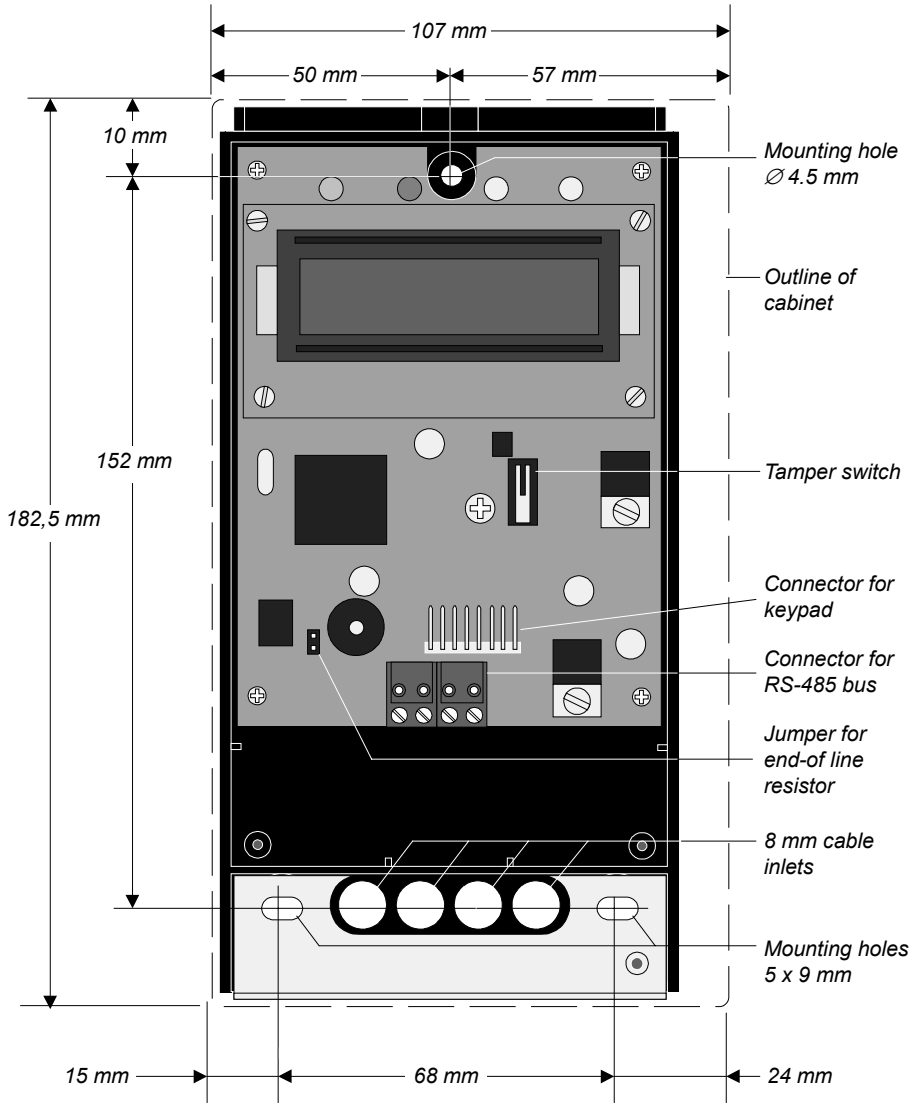
The RKP-E has three mounting holes placed as shown in Fig. 3.29. Screws for mounting should have a diameter of 3.5 to 4 mm with a length to suit the mounting method.

Cable inlets of RKP-E

The RKP-E has four 8 mm cable inlets as shown in Fig. 3.29. When mounted, there is approx. 7 mm of space behind the RKP-E for entry of cables. Cables of minimum dimensions can normally be inserted after the RKP-E has been mounted.

However, if heavy cables are used, it may be necessary to loosen the mounting screws before inserting the cables. If so, you must ensure that there is sufficient space between the RKP-E and the surface for the cables, so that you do not distort the RKP-E when you tighten the mounting screws.

Fig. 3.29 *Layout of the RKP-E showing position of mounting holes, cable inlets, connectors and jumper for end-of-line resistor.*



Ending the installation

After you have mounted the RKP-E, connected it to the RS-485 bus (See Section 3.4.3), and set the jumper for the end-of-line resistor, you can connect the flat-cable between the keypad and the circuit board taking care not to damage the cable and the connector. Then replace the cover and insert and tighten the two locking screws.

Address setting

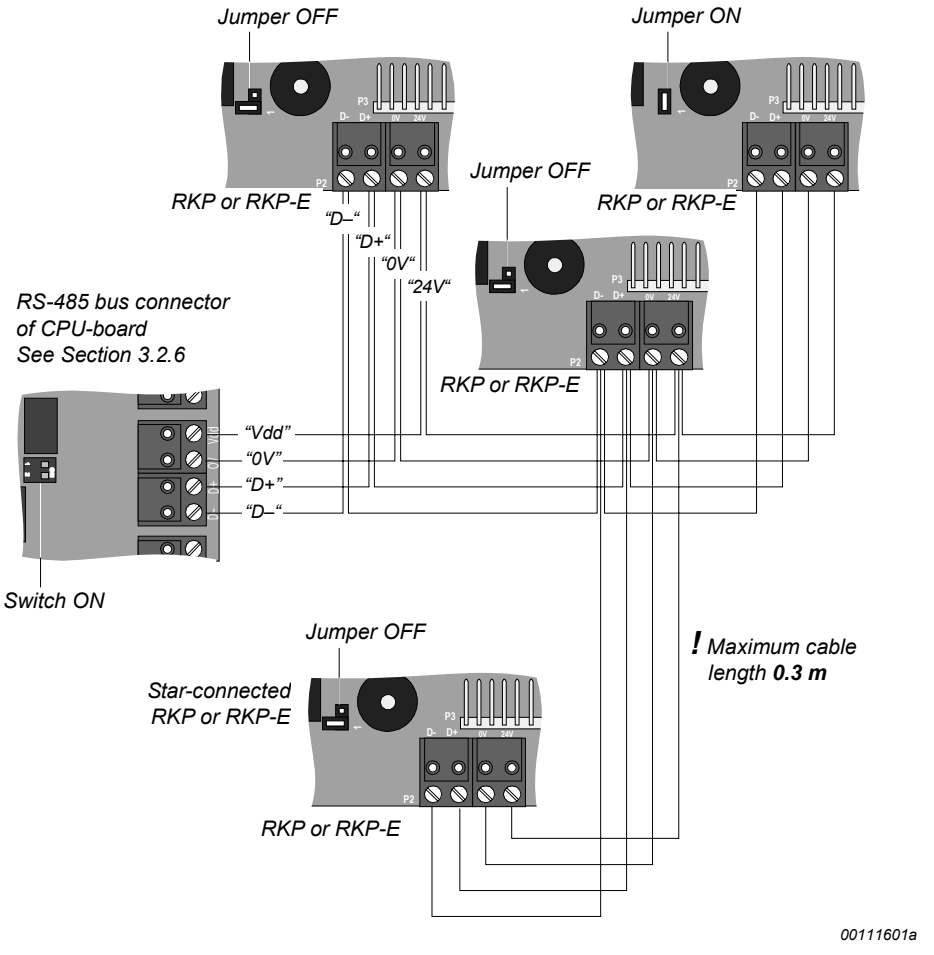
The setting of the address is performed as for the Intruder Alarm Keypad RKP. See page 3-32 for more information.

3.4.3 Connection to RS-485 bus

All Intruder Alarm Keypads (RKP and RKP-E), Time Lock Displays, etc. are connected in parallel on the bus as shown in the diagram below. You may use star-connection of an RKP or RKP-E if it is situated close to another Intruder Alarm Keypad.

! *The cable length of a star-connected RKP or RKP-E must not exceed 0.3 m*

Fig. 3.30 *Example of the connection of the RKP or RKP-E on the RS-485 bus and the connection of the RS-485 bus to the CPU-board of the ThorGuard Central Unit.*



The RS-485 bus is connected to the connector labelled “P2”. The connector has the following screw terminals:

Label	Description
“D+”	Data. Is connected to the “D+” terminal of the RS-485 bus connector of the CPU-board and the “D+” terminal of other units on the bus.
“D–“	Data. Is connected to the “D–” terminal of the RS-485 bus connector of the CPU-board and the “D–” terminal of other units on the bus.
“0V”	Ground. Is connected to the “0V” terminal of the RS-485 bus connector of the CPU-board and the “0V” terminal of other units on the bus.
“24V”	Positive supply voltage. Is connected to the “Vdd” terminal of the RS-485 bus connector of CPU-board and the “24V” terminal of other units on the bus.

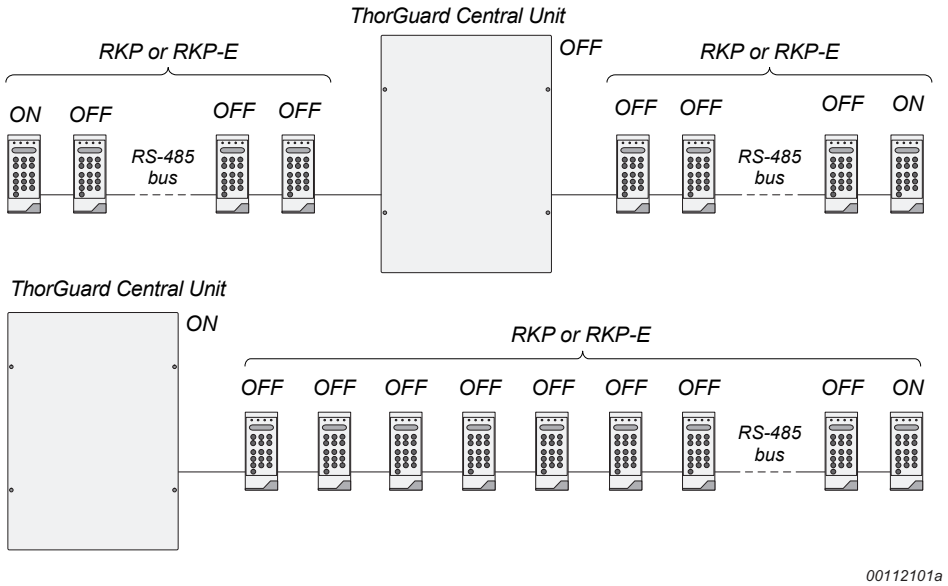
End-of-line resistor

In both ends, the RS-485 bus must be terminated with a 220 Ω resistor. This end-of-line resistor is mounted in all RKPs and all RKP-Es and in the ThorGuard Central Unit.
In the RKP and RKP-E, the resistor is placed on the circuit board as shown in Fig. 3.26, Fig. 3.29 and Fig. 3.30. It and can be connected (ON) or disconnected (OFF) by means of the jumper “J1”.

In the ThorGuard Central Unit, it is placed on the CPU-board. It can be switched ON and OFF by means of a switch (SW4) placed as shown in Fig. 3.6 and Fig. 3.12.

The actual setting of the jumper J1 and the switch SW3 will depend on the system configuration as shown in the examples of Fig. 3.31 below.

Fig. 3.31 *Setting of the end-of-line resistor jumper in the RKPs and RKP-Es and the switch for the end-of-line resistor in the ThorGuard Central Unit for two types of system layouts.*



Addresses available

The RS-485 bus itself can handle 31 addressable units. However, two addresses are occupied by the Central Unit Board. Consequently, only 29 addresses are left for other units. This means that you can connect up to 29 units that can be Intruder Alarm Keypads, External Display Modules, etc.

Current consumption

Please observe that the maximum current available from the ThorGuard Central Unit Board is not exceeded. See also Section 3.10.

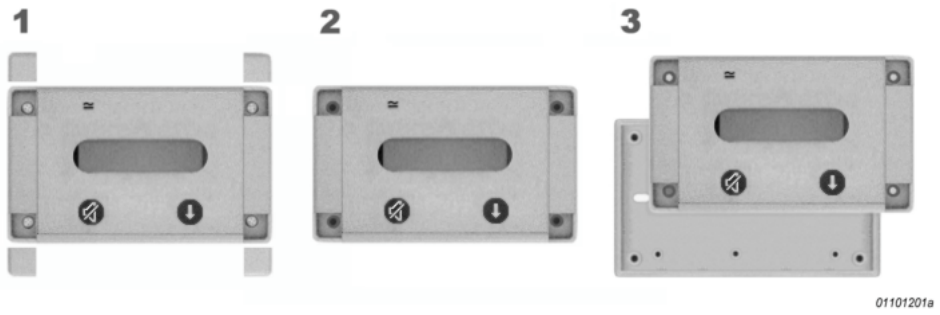
3.5 Installation of the EDM

Dismantling

Before you can mount and connect the External Display Module, you must separate its front and rear parts.
Place the External Display Module on a desk with the front part upwards and follow the instructions below, referring to Fig. 3.32:

Step	*What to do …*
1	Remove the four covering pads in the corners of the front part by inserting a small, flat-end screwdriver under the pad and push it upwards.
2	Using a PZ 1 screwdriver, remove the four screws in the corners.
3	Separate the front and rear parts.

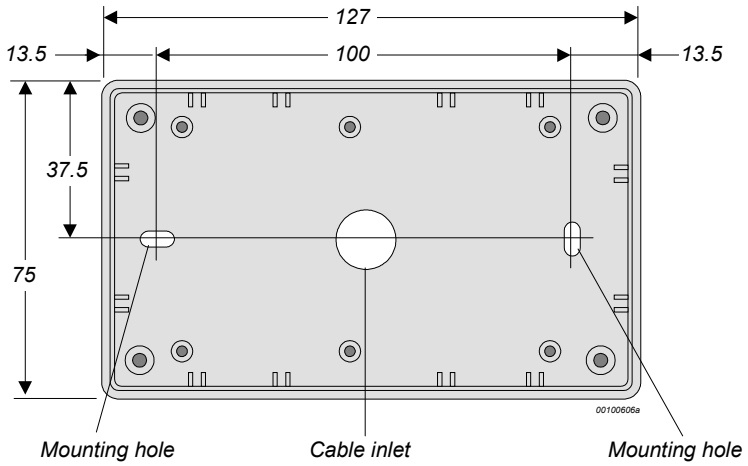
Fig. 3.32 *Separating the front and rear parts of the External Display Module.*



You can now mount the External Display Module as described in the following section.

Mounting

Fig. 3.33 *Rear part of the External Display Module. The drawing shows the position of mounting holes and cable inlets. All measurements are in mm.*

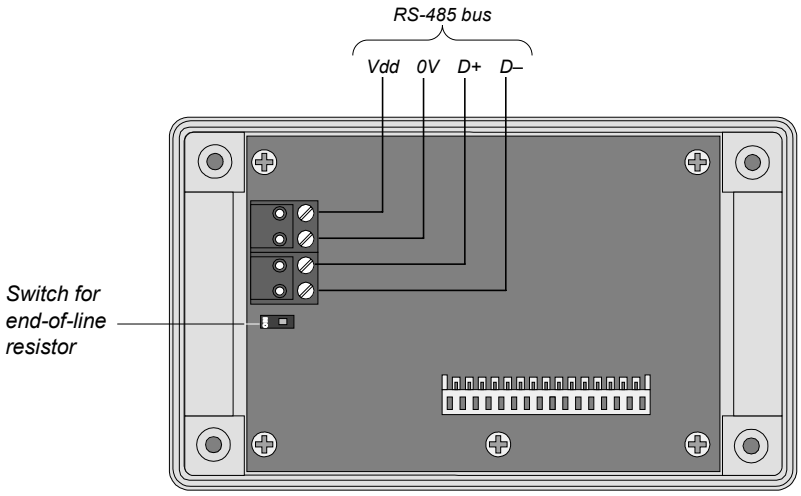


Mount the rear part by means of suitable screws placed in the mounting holes. Screws for mounting should have a diameter of 3.5 to 4 mm with a length to suit the mounting method.
After mounting, follow the instructions for connection and setting of the switch for the end-of-line resistor given in the following paragraphs. Then put the front part back in place, secure its screws and replace the covering pads.

Connection

The External Display Module is connected in parallel on the RS-485 bus as shown in the diagram below.

Fig. 3.34 *Rear side of the front part of the External Display Module showing the screw terminals.*



End-of-line resistor

The end-of-line resistor can be switched ON and OFF by means of a switch placed as shown in Fig. 3.34. The switch should be set in accordance the system configuration as shown in the examples of Fig. 3.31.

Parameter setting

Before the External Display Module can be used, a number of parameters must be set. The setting of the parameters can be started right after power has been switched on to the unit. The following settings are required

Parameters

Parameter	*Description*	*Range*
Own address	The address of the EDM on the RS-485 bus.	01 - 31
Host address	The address of the device that controls the EDM.	00 -31
Display mode	Selects the application of the EDM.	00 - 99
Instance Id	Selects the instance to which the application is related if related to an instance	0000 - 9999
Mail route	Selects the mail route.	0000 - 9999
2nd language	Selects the 2nd language to use on the EDM. After setting the 2nd language can be selected by means of the ⬇.	00 - 99

Button functions

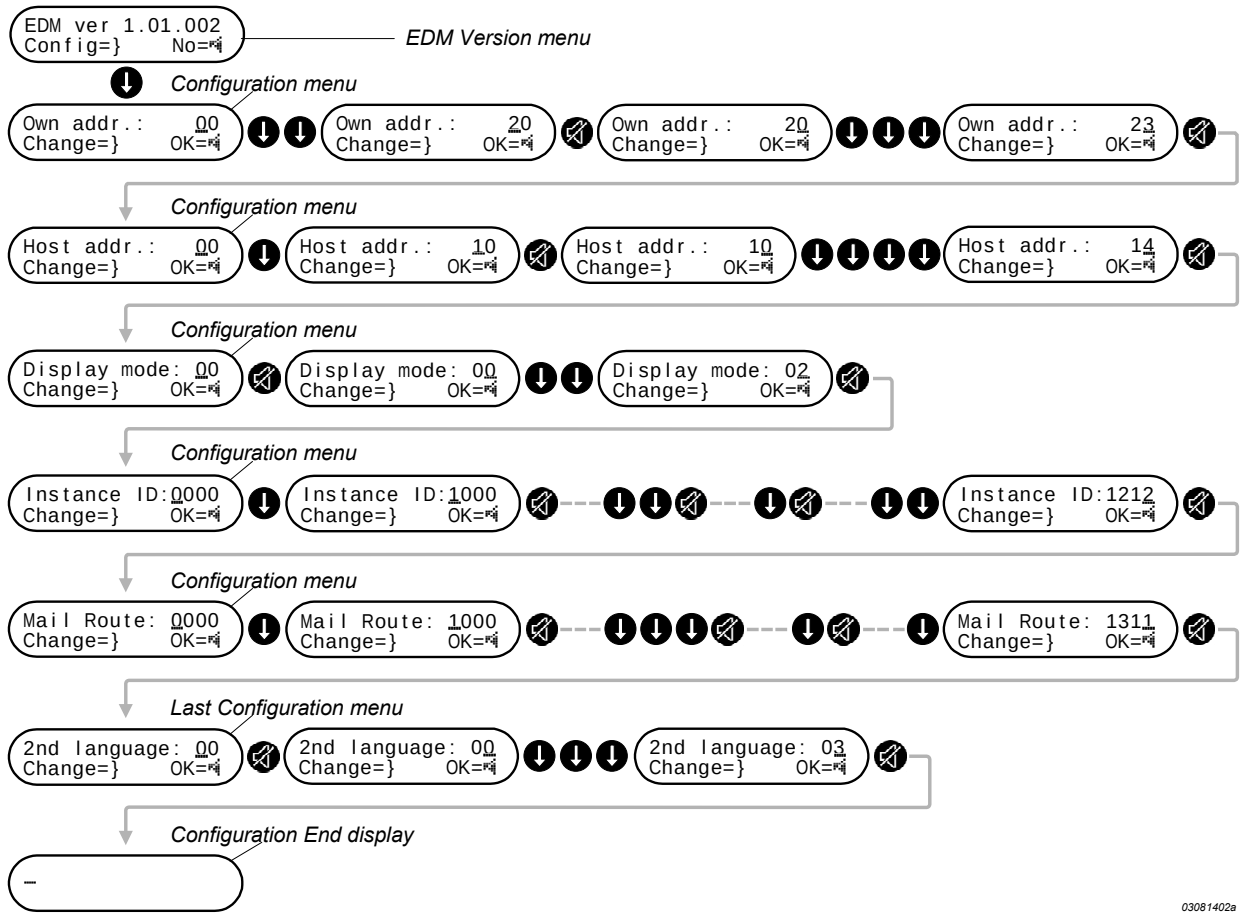
These parameters are set at power up of the unit using the display and the two buttons available. The function of the buttons will depend on the type of menu currently displayed as explained on the following page.

Button	Menu type	Function
↓	EDM Version menu	Displays the first Configuration menu for setting the RS-485 address.
	Configuration menus	Increments the digit with the underscore (cursor) by one each time the button is pressed.
⊘	EDM Version menu	Ends the setting of parameters immediately.
	Configuration menus	Moves the underscore (cursor) to the next position or displays the next Configuration menu when the last digit of a parameter has been set or – when the last digit of the last Configuration menu is set – shows the Configuration End display.

Setting procedure

Immediately after the External Display Module has been switched on, the EDM Version menu is displayed (Upper left corner of Fig. 3.35). After this, you will have eight seconds to start the setting of parameters. If you do not activate a key (⊘ or ↓), the display will return to the last Configuration menu that indicates that the setting is finished (Lower left corner of Fig. 3.35).

Fig. 3.35 *Example of the setting of the parameters of the External Display Module EDM. Please note that for the Instance ID and Mail Route Configuration menus, the indication in the display of the settings made between the setting of the first and the last digit are not shown. They are substituted by - - -.*



After you have performed the setting of the last parameter and pressed the ⊘ button, the ≃ LED flashes to indicate that the setting of parameters is finished.

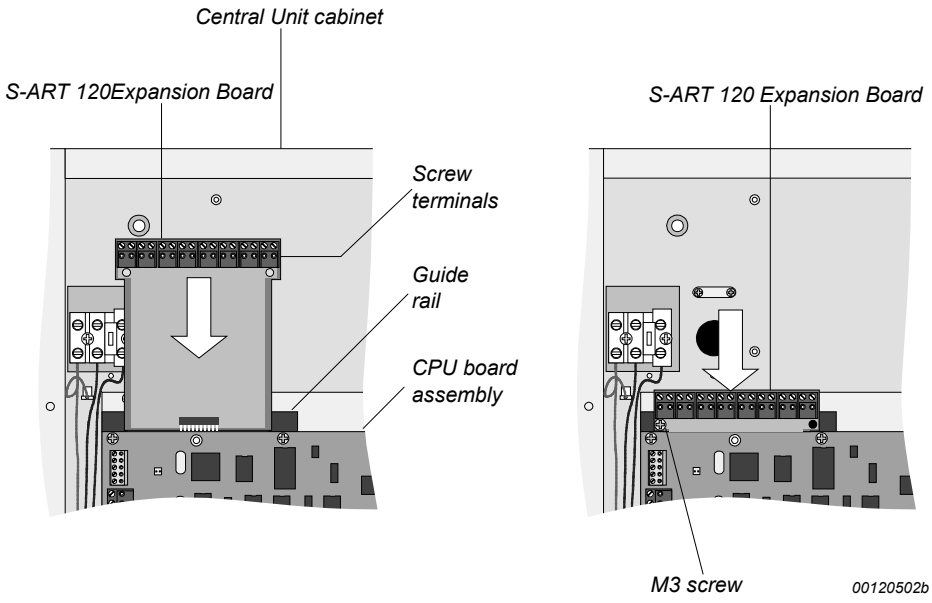
3.6 Mounting of S-ART 120 Expansion Boards

The S-ART 120 Expansion Boards are delivered ready for mounting including a M3 screw for fixing the board to the CPU-board assembly. An S-ART 120 Expansion Board can be mounted in any of the three expansion slots No. 1, No. 2 or No.3. Up to three S-ART 120 Expansion Boards can be mounted.

To mount an S-ART 120 Expansion Board, locate the free expansion slot you want to use - their position can be seen in Fig. 3.38 - and follow the instructions below, referring to Fig. 3.36:

Step	*What to do …*
1	Turn of the power to the ThorGuard Central Unit.
2	Position the S-ART 120 Expansion Board over the expansion slot with the screw terminals facing you.
3	Engage the S-ART 120 Expansion Board in the guide rails of the expansion slot.
4	Carefully, push the S-ART 120 Expansion Board fully in, taking care to engage it in the connector.
5	Insert the delivered securing screw in the proper hole in the S-ART 120 Expansion Board (See below) and fasten it.

Fig. 3.36 *Example showing the installation of an S-ART 120 Expansion Board in Slot No. 3.*



Position of securing screw

For the expansion slots No. 1 and 2, the hole for the securing screw is placed in the left hand side of the expansion slot; for the expansion slots 3 and 4, the hole is in the right hand side of the expansion slot.

Slot No. 1 and 2

When installing S-ART 120 Expansion Boards in the expansion slots No. 1 and 2, you may need to remove an installed battery to get sufficient space for the installation. After installation of the S-ART 120 Expansion Board(s), the battery is reinstalled.

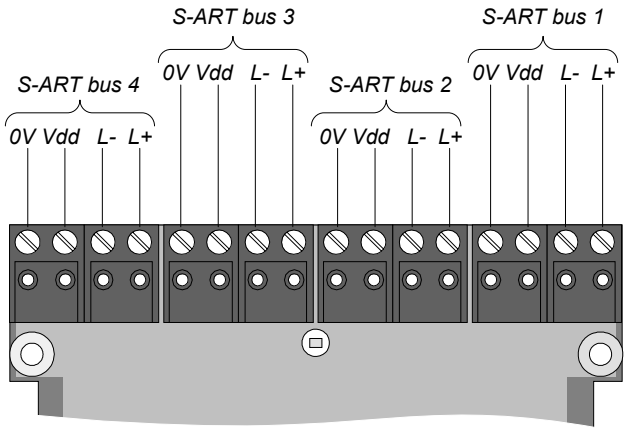
Installation of S-ART buses

The installation of the S-ART buses is described in Section 3.7 and installation of S-ART Units in Section 3.8.

Terminals

The figure below shows the position and the designation of the terminals of the S-ART 120 Expansion Board.

Fig. 3.37 *The terminals of the S-ART 120 Expansion Board and the numbering of the S-ART buses.*



Power for the S-ART Bus (Vdd)

Power (Vdd) for the S-ART buses of the S-ART 120 Expansion Boards is supplied via the “Vaux” connector when boards are mounted on a ThorGuard CPU-board, version 2.0. You will therefore have to connect power to the “Vaux” connector either from a “Vdd” terminal on the CPU-board or from an external supply.
When the S-ART 120 Expansion Boards are mounted on a ThorGuard CPU-board, version 1.0 or 1.1, Vdd is automatically supplied from the CPU-board.

For identification of the version of the ThorGuard CPU-board, see page 3-11.

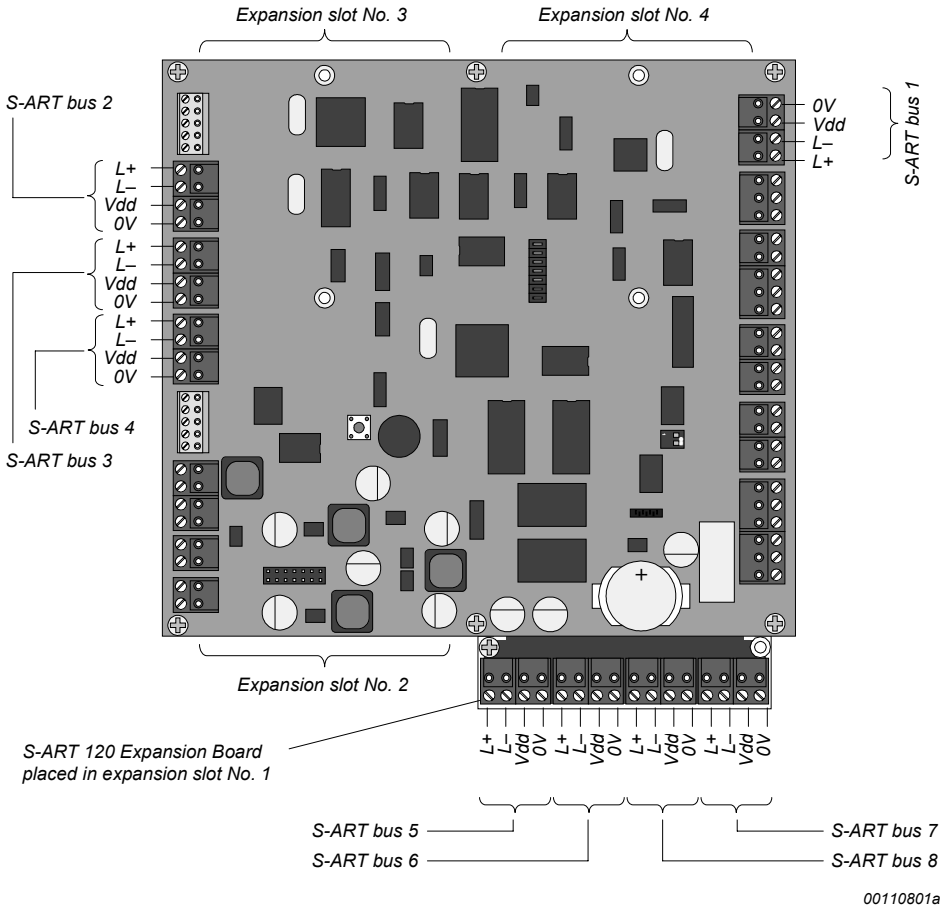
3.7 Connection of S-ART buses

Introduction

Terminals for four S-ART buses (S-ART bus 1 to S-ART bus 4) are placed on the CPU-board of the ThorGuard Central Unit as shown on Fig. 3.38.
Additional S-ART buses can be added by means of S-ART 120 Expansion Boards (See Section 3.6). In the figure below, one S-ART 120 Expansion Board has been installed in expansion slot No. 1.

Up to thirty S-ART addresses can be accommodated on each S-ART bus. The number of S-ART Units that can be connected on the individual S-ART bus depends on the types of S-ART Units used.
Some of the S-ART Units available occupy more than one address (S-106, six addresses and S-130, thirty addresses).

Fig. 3.38 *Example of CPU-board with an S-ART 120 Expansion Board placed in expansion slot No. 1. The address range of the S-ART buses is set during the programming of the ThorGuard Central Unit. See Section 2.2.9 for more information.*



The numbers of the S-ART buses of the S-ART 120 Expansion Boards are shown in Section 3.6 (s). The address ranges for the individual S-ART 120 Expansion Boards as well as the onboard S-ART Controller is set during the programming of the ThorGuard Central Unit. See Section 2.2.9 for more information.

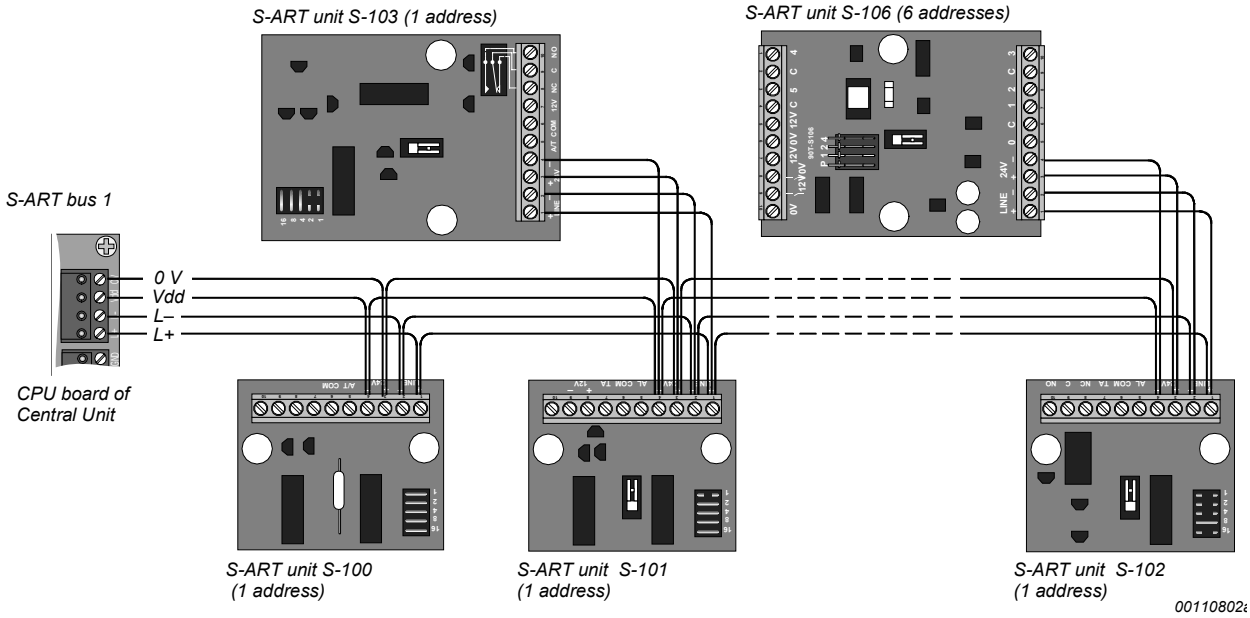
Each bus consists of four wires to which the S-ART Units are connected. Two of the wires (labelled “L+” and “L–“) are used for data communication with the various S-ART Units; the remaining two (labelled “0V” and “Vdd”) are used for the operating voltage of the units and the connected detectors.

☛ On diagrams in this manual, the S-ART bus itself is labelled “L+” and “L–“, while the operating voltage usually is labelled “Vdd” and “0 V” or “DC+” and “DC–“.

All S-ART Units are installed in the same way regarding the connections to the bus as shown in Fig. 3.39. For the connection diagram of the different S-ART Unit types, please refer to the next section.

"Star"-connections are allowed if needed. The cables can be pulled in the easiest and shortest possible way.

Fig. 3.39 *Example of the connection of S-ART Units to the S-ART bus.*



3.8 Installation of S-ART Units

Introduction

Most of the S-ART Units (S-100, S-101, S-102, S-103, S-106, S-120, S-121, S-122, and S-123) are delivered in a mounting box. The box for the S-106, S-112, and S-123 is larger than the standard box in order to accommodate the larger number of cables required. Mounting instructions for the boxes are given below while connection instructions for these S-ART Units are given on the following pages.

☛ Please note that S-ART Units S-100, S-101, S-102, S-103 have been discontinued and are substituted by S-120, S-121, S-122, and S-123, respectively.

The remaining S-ART Units are delivered without box either because they are intended for mounting inside a detector (S-107 and S-108) or because they are designed for special purposes (S-130). Mounting and connection instructions are given in Sections 3.8.7, 3.8.8, and 3.8.14, respectively.

3.8.1 Mounting S-ART Unit mounting boxes

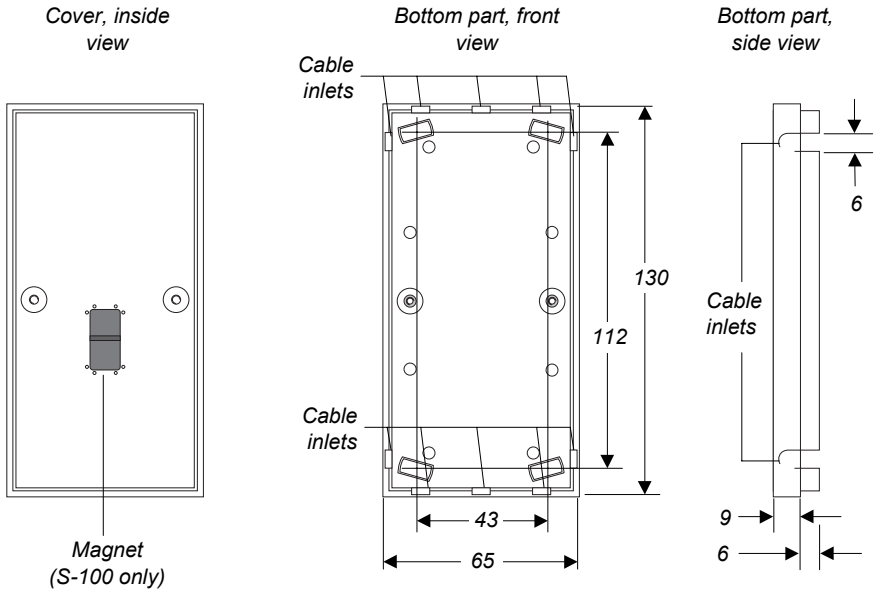
Standard box

To mount the box, loosen the two screws in the cover and remove it completely. Remove the S-ART Unit board from the box.

☛ Please observe that some S-ART Units contain resistors intended for mounting in for example detectors. These resistors are contained in the mounting box.

Remove the covering material from the cable inlets you want to use. The box has two cable inlets on both sides and three inlets in each end as shown in Fig. 3.40.

Fig. 3.40 *Cover and bottom part of the standard mounting box for S-ART Units. The drawing shows the position of mounting holes and cable inlets. All measurements are in mm.*



Mount the box by means of suitable screws (3 to 3.5 mm) using at least two screws diagonally placed in the mounting holes.

After mounting, follow the instructions for connection, setting of address, etc given in Sections 3.8.2, 3.8.3, 3.8.4, 3.8.5, 3.8.10, 3.8.11, and 3.8.12 depending on the type of S-ART Unit.

Then put the cover back in place and secure its screws. For the S-100, make sure that the magnet in the cover is placed over the tamper reed switch.

S-106, S-112 and S-123 box

To mount the box, loosen the four screws in the cover and remove it completely. Remove the S-ART Unit board from the box.

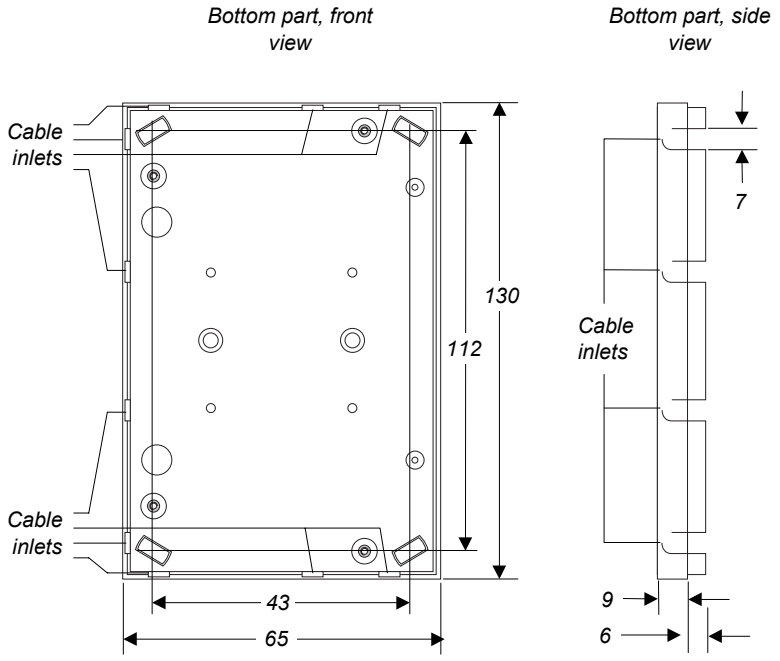
☛ Please observe that these S-ART Units contain resistors intended for mounting in the detectors. These resistors are contained in the mounting box.

Remove the covering material from the cable inlets you want to use. The box has four cable inlets on one of the sides and three inlets in each end as shown in Fig. 3.41 below.

Mount the box by means of suitable screws (3 to 3.5 mm) using at least two screws diagonally placed in the mounting holes.

After mounting, follow the instructions for connection, setting of address, etc given in Section 3.8.6 (S-106), 3.8.9 (S-112), and 3.8.13 (S-123).
Then put the cover back in place and secure its screws.

Fig. 3.41 *Bottom part of the mounting box for S-106 S-ART Units. The drawing shows the position of mounting holes and cable inlets. All measurements are in mm.*



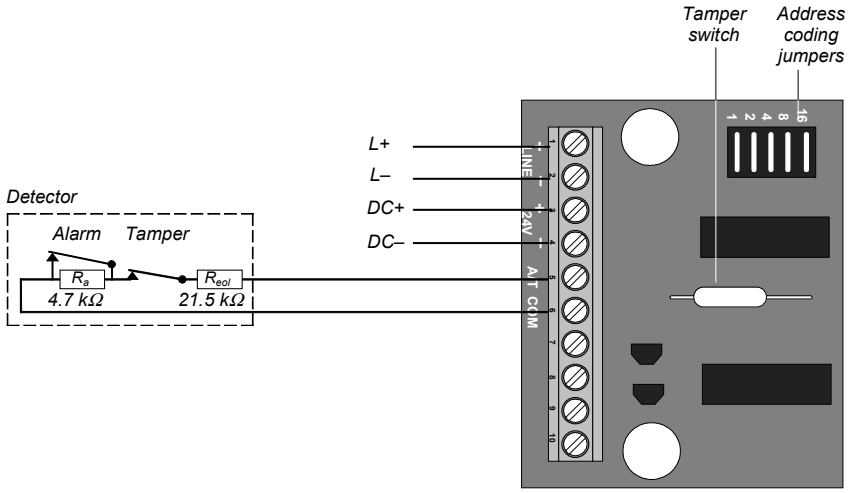
3.8.2 Connection of S-ART Unit S-100 (Discontinued)

☛ Please note that the S-ART Unit S-100 is substituted by the S-ART Unit S-120.

The S-100 is delivered with one resistor of 21.5 kΩ and one resistors of 4.7 kΩ that can be found inside the mounting box. Connect the resistors in the detector as shown in Fig. 3.42.
More information about the S-100 can be found in Section 2.2.10.

Connection diagram

Fig. 3.42 *Example of connection of S-100 to S-ART bus and detector.*



Connection

After mounting of the box and setting the address (See page 3-69), insert the S-ART Unit board in the box and connect the detector and the S-ART bus as shown in Fig. 3.42 and listed in the connection table.

Connection table

Term. No.	*Label*	*Description*
1	"Line+"	L+ of S-ART bus
2	"Line–"	L– of S-ART bus
3	"24V+"	DC+ (Vdd) of S-ART bus. See also Section 3.7
4	"24 V–"	DC– (0 V) of S-ART bus. See also Section 3.7
5	"A/T"	Alarm/tamper input
6	"COM"	Common terminal for alarm and tamper input
7	-	Not connected
8	-	Not connected
9	-	Not connected
10	-	Not connected

Address setting

Instructions for setting the address for this type of S-ART Unit are provided in Section 3.8.16.

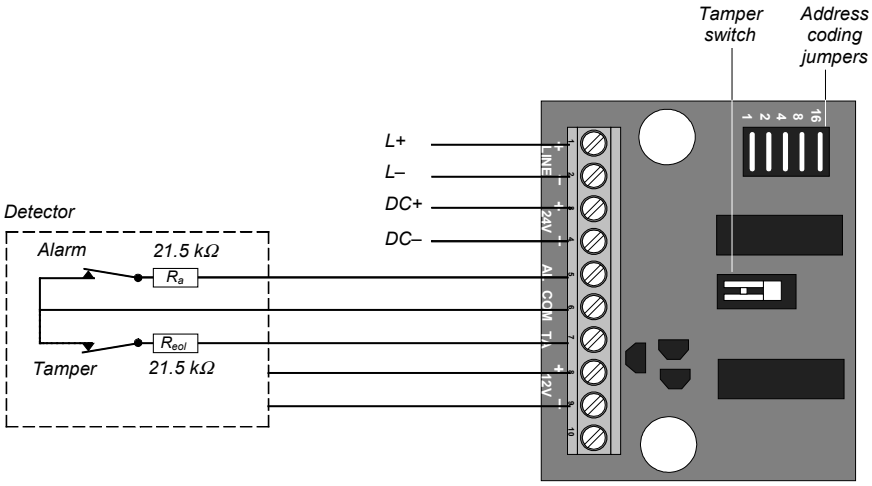
3.8.3 Connection of S-ART Unit S-101 (Discontinued)

☛ Please note that the S-ART Unit S-101 is substituted by the S-ART Unit S-121.

The S-101 is delivered with two resistors of 21.5 kΩ that can be found inside the mounting box. Connect the resistors in the detector as shown in Fig. 3.43. More information about the S-101 can be found in Section 2.2.11.

Connection diagram

Fig. 3.43 *Example of connection of S-101 to S-ART bus and detector.*



00103002a

Connection

After mounting of the box and setting the address (See page 3-69), insert the S-ART Unit board in the box and connect the detector and the S-ART bus as shown in Fig. 3.43 and listed in the connection table.

Connection table

Term. No.	*Label*	*Description*
1	"Line+"	L+ of S-ART bus
2	"Line–"	L– of S-ART bus
3	"24V+"	DC+ (Vdd) of S-ART bus. See also Section 3.7
4	"24 V–"	DC– (0 V) of S-ART bus. See also Section 3.7
5	"AL"	Alarm input
6	"COM"	Common terminal for alarm and tamper inputs
7	"TA"	Tamper input
8	"12V+"	12 V DC output.
9	"12V–"	Ground for 12 V DC output.
10	-	Not connected

Address setting

Instructions for setting the address for this type of S-ART Unit are provided in Section 3.8.16.

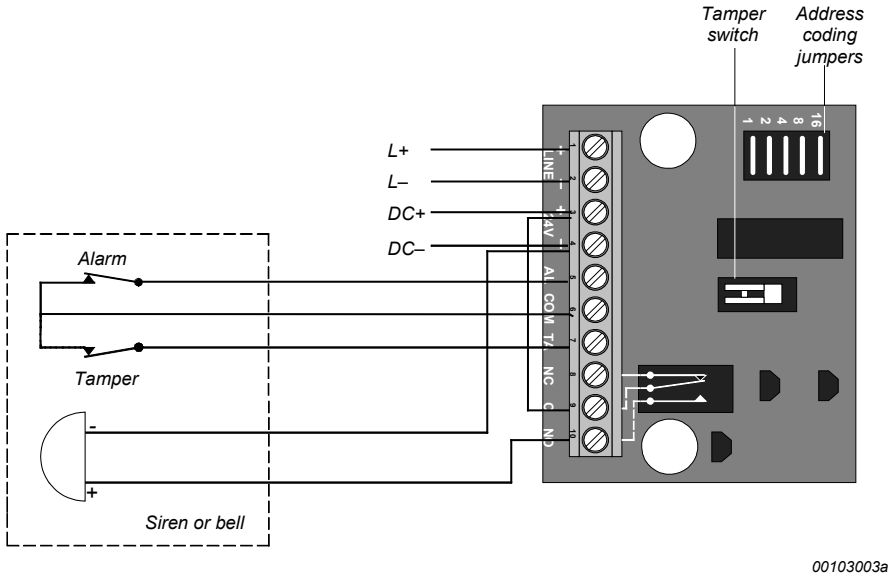
3.8.4 Connection of S-ART Unit S-102 (Discontinued)

☛ Please note that the S-ART Unit S-102 is substituted by the S-ART Unit S-122.

When connecting this S-ART Unit to a siren or bell that is not equipped with alarm and tamper contacts, you will need two jumpers for short-circuiting the “AL” and “COM” and “TA” and “COM” terminals of the S-ART Unit.
More information about the S-102 can be found in Section 2.2.12.

Connection diagram

Fig. 3.44 *Example of connection of S-102 to S-ART bus and bell or siren.*



Connection

After mounting of the box and setting the address (See page 3-69), insert the S-ART Unit board in the box and connect the siren or bell and the S-ART bus as shown in Fig. 3.44 and listed in the connection table.

Connection table

Term. No.	*Label*	*Description*
1	“Line+”	L+ of S-ART bus
2	“Line–“	L– of S-ART bus
3	“24V+”	DC+ (Vdd) of S-ART bus. See also Section 3.7
4	“24V–“	DC– (0 V) of S-ART bus. See also Section 3.7
5	“AL”	Alarm input
6	“COM”	Common terminal for alarm and tamper inputs
7	“TA”	Tamper input
8	“NC”	Relay, normally closed contact
9	“C”	Relay, common
10	“NO”	Relay, normally open contact

Address setting

Instructions for setting the address for this type of S-ART Unit are provided in Section 3.8.16.

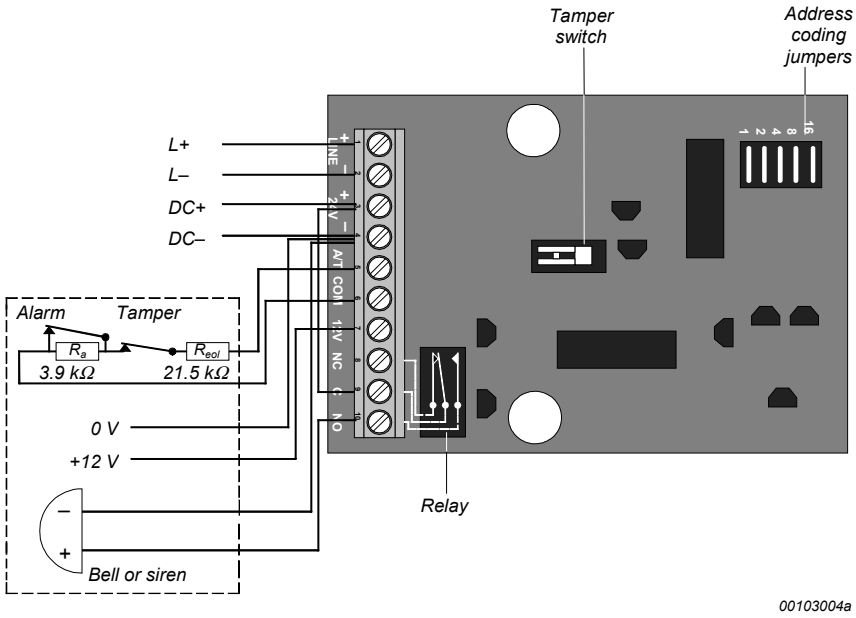
3.8.5 Connection of S-ART Unit S-103 (Discontinued)

☛ Please note that the S-ART Unit S-103 is substituted by the S-ART Unit S-123.

The S-103 is delivered with one resistor of 3.9 kΩ and one of 21.5 kΩ, that can be found inside the mounting box. Connect the resistors to the alarm and tamper switches of the bell or siren as shown in Fig. 3.45.
If the siren or bell you are using is not equipped with alarm and tamper contacts, the “AT” and “COM” terminals should be short-circuited with a jumper.
More information about the S-103 can be found in Section 2.2.13.

Connection diagram

Fig. 3.45 *Example of connection of S-103 to the S-ART bus and bell or siren.*



Connection

After mounting of the box and setting the address (See page 3-69), insert the S-ART Unit board in the box and connect the bell or siren and the S-ART bus as shown in Fig. 3.45 and listed in the connection table.

Connection table

Term. No.	*Label*	*Description*
1	“Line+”	L+ of S-ART bus
2	“Line–“	L– of S-ART bus
3	“24V+”	DC+ (Vdd) of S-ART bus. See also Section 3.7
4	“24 V–“	DC– (0V) of S-ART bus. See also Section 3.7
5	“A/T”	Alarm/tamper input
6	“COM”	Common terminal for alarm and tamper input
7	“12V”	12 V output (See below for further information)
8	“NC”	Relay, Normally closed contact
9	“C”	Relay, common
10	“NO”	Relay, Normally open contact

12 V DC power output

This output is used for powering any electronic circuit in the siren or bell needing a 12V DC supply in case this cannot be operated from the DC+ (Vdd) and DC– (0V) of the S-ART bus.

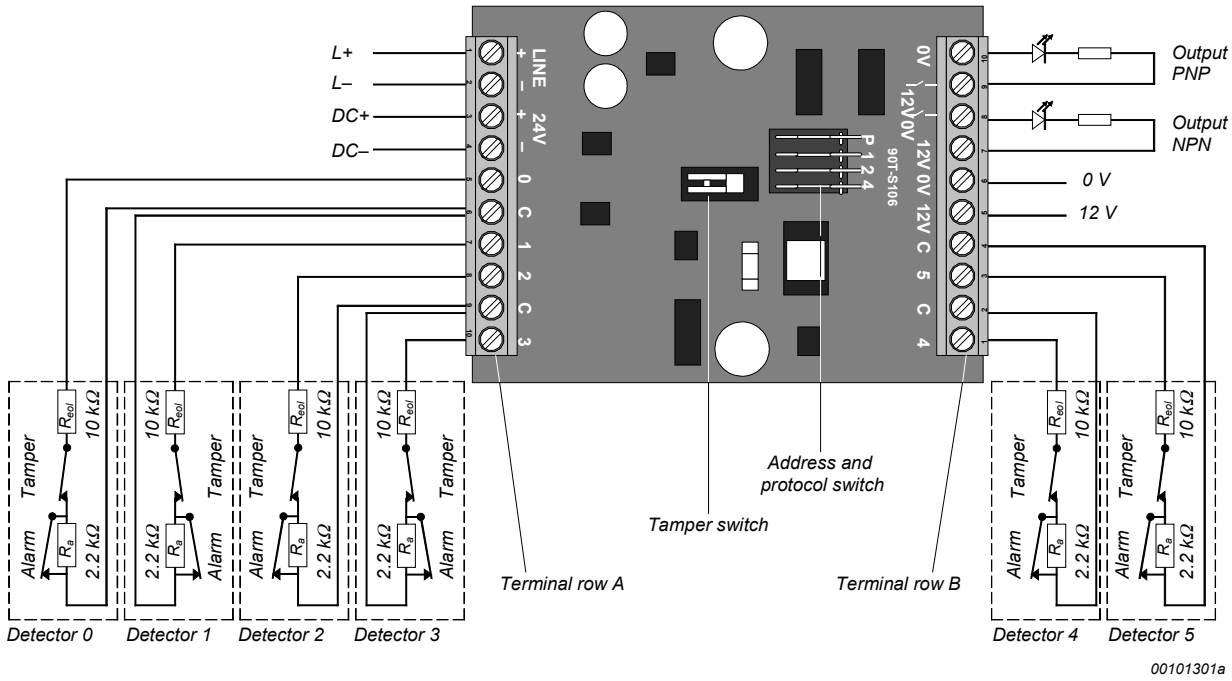
Address setting

Instructions for setting the address for this type of S-ART Unit are provided in Section 3.8.16.

3.8.6 Connection of S-ART Unit S-106

The S-106 is delivered with six resistors of 2.2 kΩ and six resistors of 10 kΩ, that can be found inside the mounting box. Connect the resistors in the detectors as shown in Fig. 3.46.
More information about the S-106 can be found in Section 2.2.14.

Fig. 3.46 *Example of connection of S-106 to S-ART bus and detectors.*



Connection

After mounting of the box and setting the address (See the following page), insert the S-ART Unit board in the box and connect the detectors and the S-ART bus as shown in Fig. 3.46 and listed in the connection table.
The tamper contact of the S-ART Unit is in series with the tamper input on loop 0.

Note The best noise immunity is achieved by connecting the alarm resistor (2.2 kΩ) to the “C” -terminal (COM) as shown in the connection diagram.

Connection table

	Term. No.	*Label*	*Description*
Terminal row A	1	“Line+”	L+ of S-ART bus
	2	“Line–”	L– of S-ART bus
	3	“24V+”	DC+ (Vdd) of S-ART bus. See also Section 3.7
	4	“24 V–“	DC– (0 V) of S-ART bus. See also Section 3.7
	5	“0”	Alarm/tamper input from detector 0 (Loop 0)
	6	“C”	Common terminal for alarm/tamper input, detector 0 and detector 1
	7	“1”	Alarm/tamper input from detector 1 (Loop 1)
	8	“2”	Alarm/tamper input from detector 2 (Loop 2)
	9	“C”	Common terminal for alarm/tamper input, detector 2 and detector 3
	10	“3”	Alarm/tamper input from detector 3 (Loop 3)

	Term. No.	*Label*	*Description*
Terminal row B	1	"4"	Alarm/tamper input from detector 4 (Loop 4)
	2	"C"	Common terminal for alarm/tamper input, detector 4
	3	"5"	Alarm/tamper input from detector 5 (Loop 5)
	4	"C"	Common terminal for alarm/tamper input, detector 5
	5	"12V"	12 V DC power output for detectors
	6	"0V"	
	7	"12V"	Open collector NPN output
	8	"0V"	
	9	"12V"	Open emitter PNP output
	10	"0V"	

NPN and PNP outputs

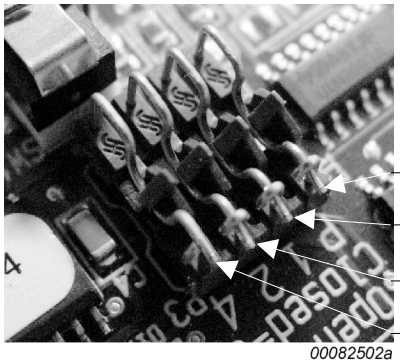
These outputs can be used for connection of for example an indicator LED for indicating the state of loop 0. You can use either the NPN output or the PNP output.

12 V DC power output for detectors

This output is used for powering any detectors needing a 12V DC supply in case these cannot be operated from the DC+ (Vdd) and DC– (0 V) of the S-ART bus.

Address and protocol switch

The addresses used and the protocol to use on the S-ART bus are set by opening or closing the jumpers on the address switch. See the example below.



The example shows that inverted protocol has been selected and the addresses have been set to the address range 24 to 29.

Protocol setting

The jumper "P" sets the protocol applied:

Open: Normal S-ART protocol
Closed: Inverted S-ART protocol

Address setting

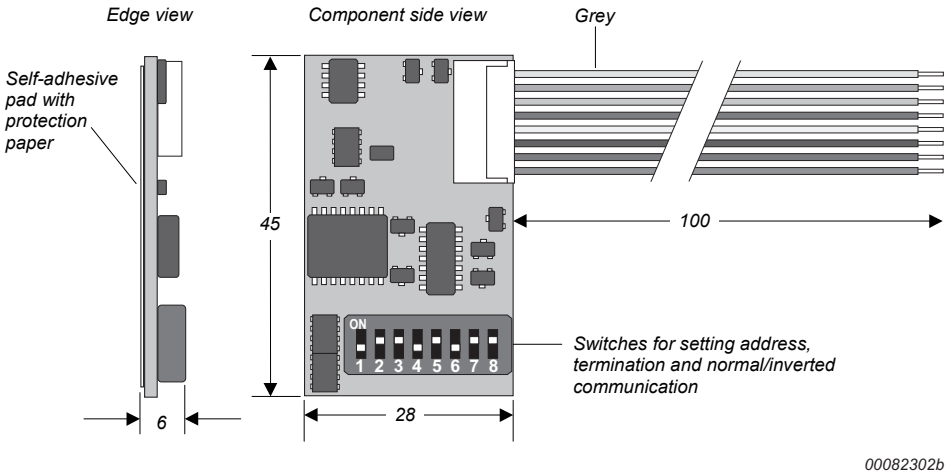
The six input loops are numbered from 0 to 5. The addresses used on the S-ART bus depends on the programmed address on the address switch. The address of the output (NPN or PNP) is automatically set to the address of loop 0.
The switches "1", "2" and "4" set the addresses to use. They are set in sets of six addresses as follows:

S-ART	*Switch "1"*	*Switch "2"*	*Switch "4"*
00 – 05	Closed	Closed	Closed
06 – 11	Open	Closed	Closed
12 – 17	Closed	Open	Closed
18 – 23	Open	Open	Closed
24 – 29	Closed	Closed	Open

3.8.7 Mounting and connection of S-ART Unit S-107

The S-107 is delivered with three resistors to be used in pairs depending on the required termination (10 kΩ or 21.5 kΩ). They can be found In the ESD protective envelope together with an 8-lead connection cable. Connect the resistors in the detector as shown in Fig. 3.47.
More information about the S-107 can be found in Section 2.2.15.

Fig. 3.47 *Layout and dimensions of S-107. All measurements are in mm.*



Connection

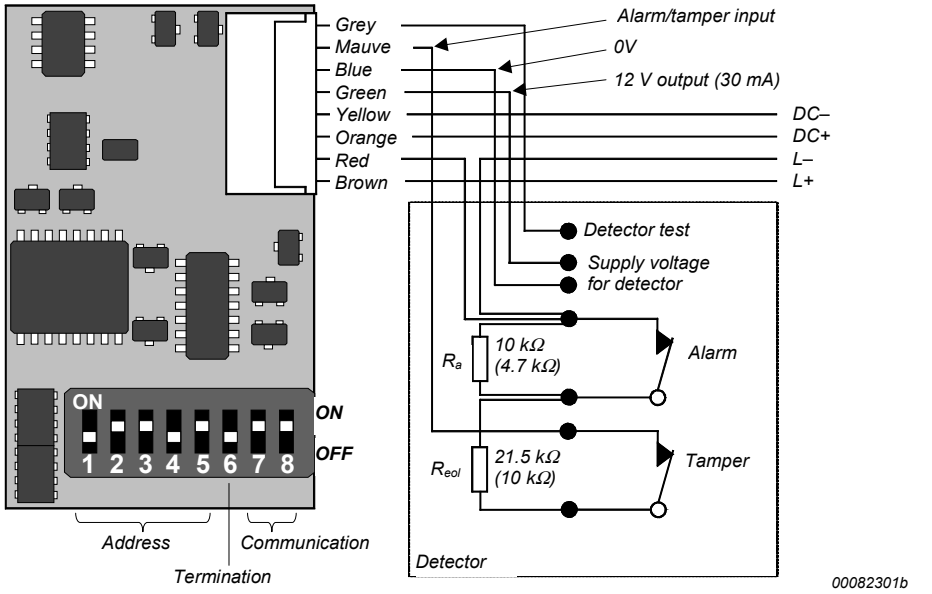
Disassemble the detector, connect the supplied connection cable and the resistors as shown in Fig. 3.48 and listed in the connection table. Connect the cable to the connector of the S-ART Unit observing its correct orientation.

Mounting

Peel the protective paper off the S-ART Unit, and place the unit in a suitable place inside the detector, so that you can set the switches as required (See following page) and so that the cable can be properly placed to avoid damage to the cable and the detector when the detector is assembled.

Connection diagram

Fig. 3.48 *Example of connection of S-107 to S-ART bus and detector.*



Connection table

Colour	*Designation*	*Description*
Grey	Test	Detector test input
Mauve	A/T	Alarm and tamper input
Blue	0 V	Ground for supply voltage for detector
Green	12 V	12 V supply voltage for detector
Yellow	DC–	DC– (0 V) of S-ART bus. See also Section 3.7
Orange	DC+	DC+ (Vdd) of S-ART bus. See also Section 3.7
Red	L–	L- of S-ART bus
Brown	L+	L+ of S-ART bus

The S-107 is equipped with a set of switches placed as shown in Fig. 3.48. Switches “1” to “5” are used for setting the address. Switch “6” is used for selection of the termination while the switches “7” and “8” are used for setting the communication (normal or inverted).

Setting the address

The address of the S-ART Unit is set by means of the switches “1” to “5”. The address can be set in the range 00 to 29. Setting takes place as shown in the table below:

	Switch number						*Switch number*						*Switch number*				
Address	*1*	*2*	*3*	*4*	*5*	*Address*	*1*	*2*	*3*	*4*	*5*	*Address*	*1*	*2*	*3*	*4*	*5*
00	ON	ON	ON	ON	ON	10	ON	OFF	ON	OFF	ON	20	ON	ON	OFF	ON	OFF
01	OFF	ON	ON	ON	ON	11	OFF	OFF	ON	OFF	ON	21	OFF	ON	OFF	ON	OFF
02	ON	OFF	ON	ON	ON	12	ON	ON	OFF	OFF	ON	22	ON	OFF	OFF	ON	OFF
03	OFF	OFF	ON	ON	ON	13	OFF	ON	OFF	OFF	ON	23	OFF	OFF	OFF	ON	OFF
04	ON	ON	OFF	ON	ON	14	ON	OFF	OFF	OFF	ON	24	ON	ON	ON	OFF	OFF
05	OFF	ON	OFF	ON	ON	15	OFF	OFF	OFF	OFF	ON	25	OFF	ON	ON	OFF	OFF
06	ON	OFF	OFF	ON	ON	16	ON	ON	ON	ON	OFF	26	ON	OFF	ON	OFF	OFF
07	OFF	OFF	OFF	ON	ON	17	OFF	ON	ON	ON	OFF	27	OFF	OFF	ON	OFF	OFF
08	ON	ON	ON	OFF	ON	18	ON	OFF	ON	ON	OFF	28	ON	ON	OFF	OFF	OFF
09	OFF	ON	ON	OFF	ON	19	OFF	OFF	ON	ON	OFF	29	OFF	ON	OFF	OFF	OFF

Setting the termination

The termination is set by means of switch “6”. If you use termination with 10 kΩ resistor, the switch should be set ON; using 21.5 kΩ, the switch must be set OFF. The delivered resistors of 21,5 kΩ, 10 kΩ and 4,7 kΩ are applied as follows:

Switch 6	R_{eol}	R_a
ON	10 kΩ	4,7 kΩ
OFF	21,5 kΩ	10 kΩ

Setting the communication

The communication on the S-ART bus for the signals from the alarm and sabotage contacts can be either normal or inverted.
The required communication is set by means of the switches “7” and “8”. Both switches must be either ON or OFF.

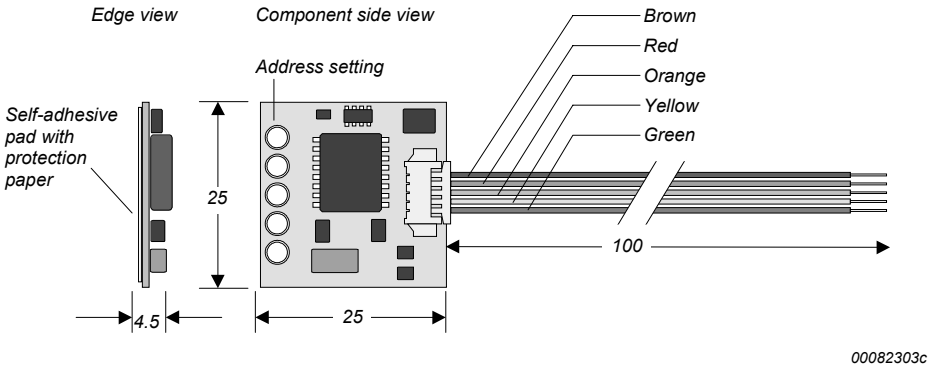
Switch 7 and 8	*Communication*
Both ON	Normal
Both OFF	Inverted

In Fig. 3.48, the switches “1” to “5” are set to address 09, switch “6” to OFF corresponding to the application of the resistors 21.5 kΩ and 10 kΩ. The switches “7” and “8” are set ON providing normal communication (Non-inverted).

3.8.8 Mounting and connection of S-ART Unit S-108

The S-108 is a sub-miniature S-ART Unit that can be mounted inside various detectors. It is equipped with leads for direct connection to the terminals of the detector by means of five leads terminated in a connector on the circuit board. The S-ART Unit is fixed inside the detector by means of a self-adhesive pad fixed to the rear side of the S-ART Unit. See Fig. 3.49 below.
More information about the S-108 can be found in Section 2.2.16.

Fig. 3.49 *Layout and dimensions of S-108. All measurements are in mm.*



Connection

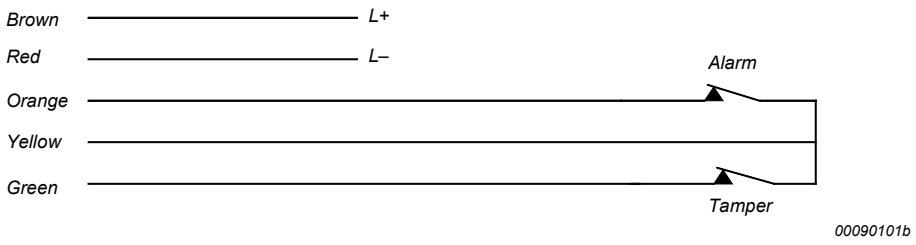
Disassemble the detector and connect the S-108 as shown in Fig. 3.49 and listed in the connection table. Please note that resistances up to 100 kΩ in series with the tamper and alarm inputs are allowed.
Set the address by cutting the appropriate jumpers as explained and shown on the following page.

Mounting

Peel the protective paper off the S-ART Unit, and place the unit in a suitable place inside the detector so that the cable can be properly placed to avoid damage to the cable and the detector when the detector is assembled.

Connection diagram

Fig. 3.50 *Example of connection of S-108 to S-ART bus and detectors.*



Connection table

Colour	*Designation*	*Description*
Brown	L +	L+ of S-ART bus
Red	L –	L– of S-ART bus
Orange	A	Alarm input
Yellow	C	Common
Green	T	Tamper input

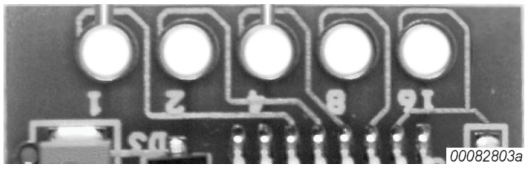
Setting the address

The address of the S-108 is set by cutting of jumpers. The jumpers are formed as holes near the edge of the circuit board and are cut by means of a pair of *small* side-cutters. The holes are labelled “1”, “2”, “4”, “8”, and “16”. The table below shows which jumpers to cut to achieve a certain address.

	Hole number						***Hole number***						***Hole number***				
Address	***1***	***2***	***4***	***8***	***16***	***Address***	***1***	***2***	***4***	***8***	***16***	***Address***	***1***	***2***	***4***	***8***	***16***
00	O	O	O	O	O	10	O	∪	O	∪	O	20	O	O	∪	O	∪
01	∪	O	O	O	O	11	∪	∪	O	∪	O	21	∪	O	∪	O	∪
02	O	∪	O	O	O	12	O	O	∪	∪	O	22	O	∪	∪	O	∪
03	∪	∪	O	O	O	13	∪	O	∪	∪	O	23	∪	∪	∪	O	∪
04	O	O	∪	O	O	14	O	∪	∪	∪	O	24	O	O	O	∪	∪
05	∪	O	∪	O	O	15	∪	∪	∪	∪	O	25	∪	O	O	∪	∪
06	O	∪	∪	O	O	16	O	O	O	O	∪	26	O	∪	O	∪	∪
07	∪	∪	∪	O	O	17	∪	O	O	O	∪	27	∪	∪	O	∪	∪
08	O	O	O	∪	O	18	O	∪	O	O	∪	28	O	O	∪	∪	∪
09	∪	O	O	∪	O	19	∪	∪	O	O	∪	29	∪	O	∪	∪	∪

∪ = Cut O = Uncut

In the example to the right, the jumpers “1” and “4” have been cut while the jumpers “2”, “8” and “16” are uncut thereby fixing the address to



3.8.9 Connection of S-ART Unit S-112

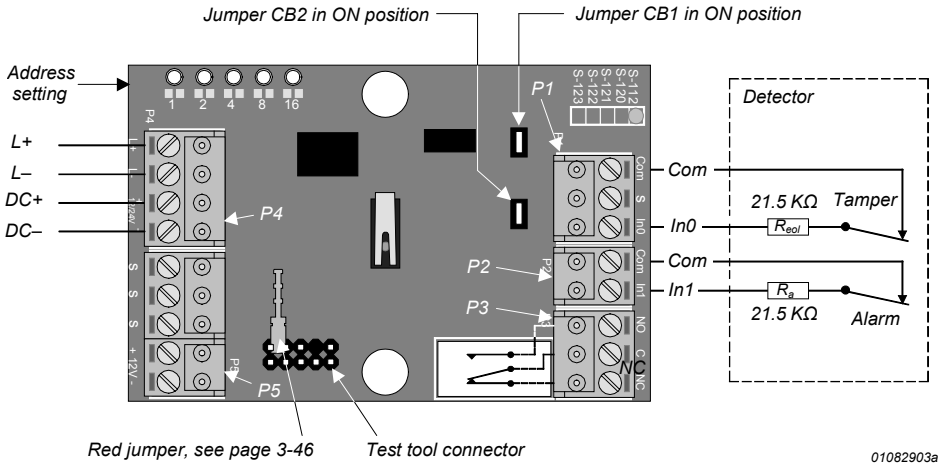
The S-112 is delivered with two resistors of 21.5 kΩ found inside the mounting box. Their use depend on the application as explained below.

Connection

After setting the address as explained in Section 3.8.16 and mounting the box, you can connect the S-ART Unit in accordance with the application as a substitute for the S-ART Unit S-101 or the S-102 as the examples of Fig. 3.51 and Fig. 3.52, respectively, and listed in the associated connection tables.

Connection diagram (S-101 substitute)

Fig. 3.51 *Example of connection of S-112 when used as a substitute for S-101.*



The jumpers CB1 and CB2

The two 21.5 kΩ resistors are used as shown in Fig. 3.51. The jumpers “CB1” and “CB2” are both are both set in their ON position.
More information about the S-112 can be found in Section 2.2.17.

Connection table (S-101 substitute)

The labelling of the terminals is placed next to the terminal connectors.

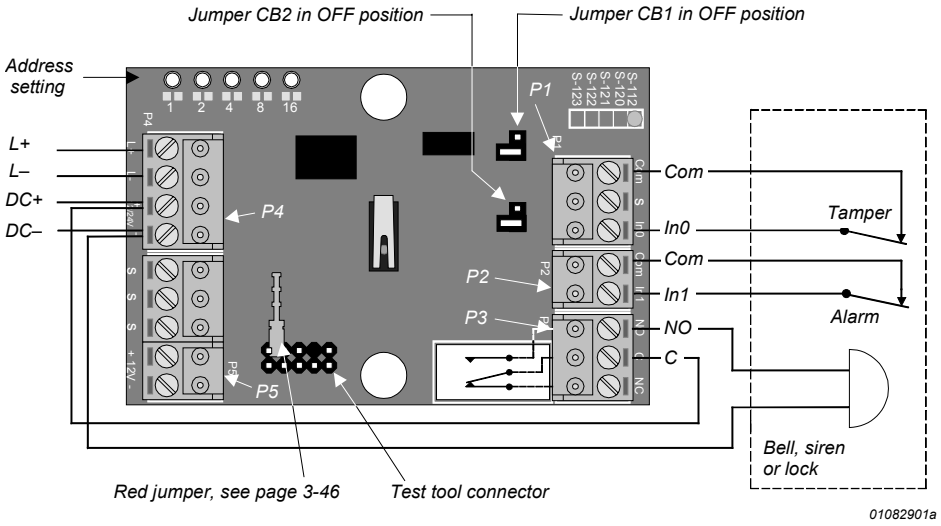
Conn.	*No.*	*Label*		*Description*	
P4	1	“L+”		L+ of S-ART bus	
	2	“L–“		L– of S-ART bus	
	3	“12V/24V”	“+”	DC+ (Vdd) of S-ART bus. See also Section 3.7	
	4		“–“	DC– (0 V) of S-ART bus. See also Section 3.7	
P5	1	“S”		Loop terminal.	
	2	“S”		Loop terminal.	
	3	“S”		Loop terminal.	
	4	“12V”	“+”	12 V DC output.	Not used in this application
	5		“-”	Ground for 12 V DC output.	
P1	1	“In0”		Terminal for input loop 0 (Tamper).	
	2	“S”		Loop terminal.	
	3	“COM”		Terminal for input loop 0 (Tamper).	
P2	2	“Com”		Terminal for input loop 1 (Alarm).	
	1	“In1”		Terminal for input loop 1 (Alarm).	

Continued ...

Conn.	No.	Label	Description	
P3	3	"NO"	Relay, normally open contact	Not used in this application
	2	"C"	Relay, common	
	1	"NC"	Relay, normally closed contact	

Connection diagram (S-102 substitute)

Fig. 3.52 Example of connection of S-112 when used as a substitute for S-102.



The jumpers CB1 and CB2

The two 21.5 kΩ resistors are used as shown in Fig. 3.52. The jumpers "CB1" and "CB2" are both are set in their OFF position.
More information about the S-112 can be found in Section 2.2.17.

Connection table (S-102 substitute)

The labelling of the terminals is placed next to the terminal connectors.

Conn.	No.	Label		Description	
P4	1	"L+"		L+ of S-ART bus	
	2	"L–"		L– of S-ART bus	
	3	"12V/24V"	"+"	DC+ (Vdd) of S-ART bus. See also Section 3.7	
	4		"–"	DC– (0 V) of S-ART bus. See also Section 3.7	
P5	1	"S"		Loop terminal.	
	2	"S"		Loop terminal.	
	3	"S"		Loop terminal.	
	4	"12V"	"+"	12 V DC output.	Not used in this application
	5		"-"	Ground for 12 V DC output.	
P1	1	"In0"		Terminal for input loop 0 (Tamper).	
	2	"S"		Loop terminal.	
	3	"COM"		Terminal for input loop 0 (Tamper).	
P2	2	"Com"		Terminal for input loop 1 (Alarm).	
	1	"IN1"		Terminal for input loop 1 (Alarm).	
P3	3	"NO"		Relay, normally open contact	Not used in this application
	2	"C"		Relay, common	
	1	"NC"		Relay, normally closed contact	

12 V DC power output

The output is used for powering any electronic circuitry in for example a siren or bell needing a 12V DC supply in case this cannot be operated from the DC+ (Vdd) and DC– (0 V) of the S-ART bus if this supply voltage (for example 24 V DC) exceeds the maximum operating voltage of the circuitry. This output requires an input voltage of at least 17.5 V DC (DC+, DC– or Vdd, 0V).

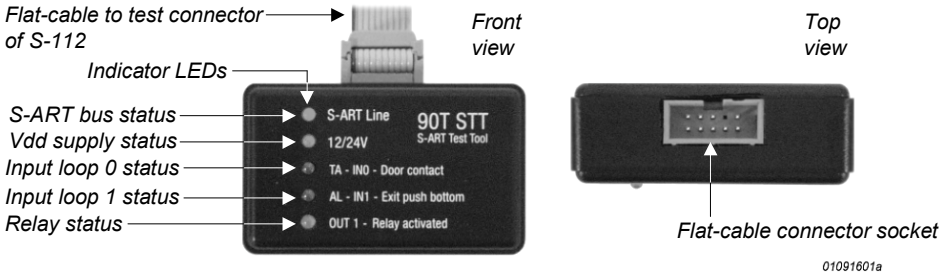
Test tool connector

The S-112 is equipped with a connector for test tool STT. The Test Tool, equipped with one metre of cable, is easily connected to the S-ART Unit. With LED indicators, the STT shows the status for S-ART line, Vdd supply, input loop 0, input loop 1, and relay.

Test tool STT

The S-ART Test Tool STT is connected to test connector on the S-ART Unit S-112 by means of a flat-cable terminated in both ends with a polarized 10-pole connector delivered together with the STT.

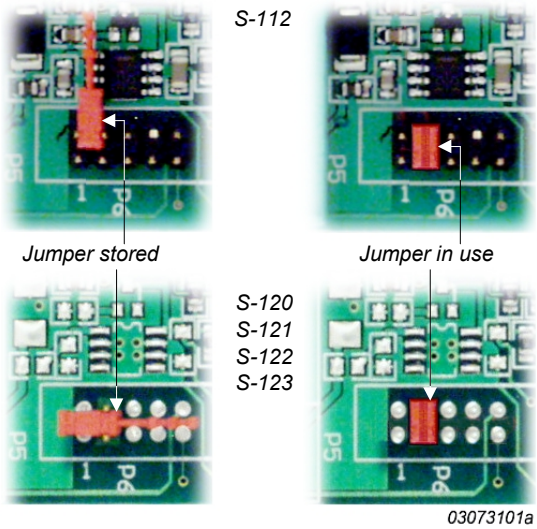
Fig. 3.53 *S-ART Test Tool STT.*



Red jumper

A red jumper is stored on the test tool connector of the S-112. The jumper can be removed and placed on the two pins of the connector as shown to the right. It shortcircuits the tamper switch to avoid alarms during connection of the S-ART Unit.

The jumper is also present in the S-ART Units S-120, S-121, S-122, and S-123 as shown to the left. For these units, only two pins are present. When the jumper is placed on these pins, tamper swith is shortcircuited.



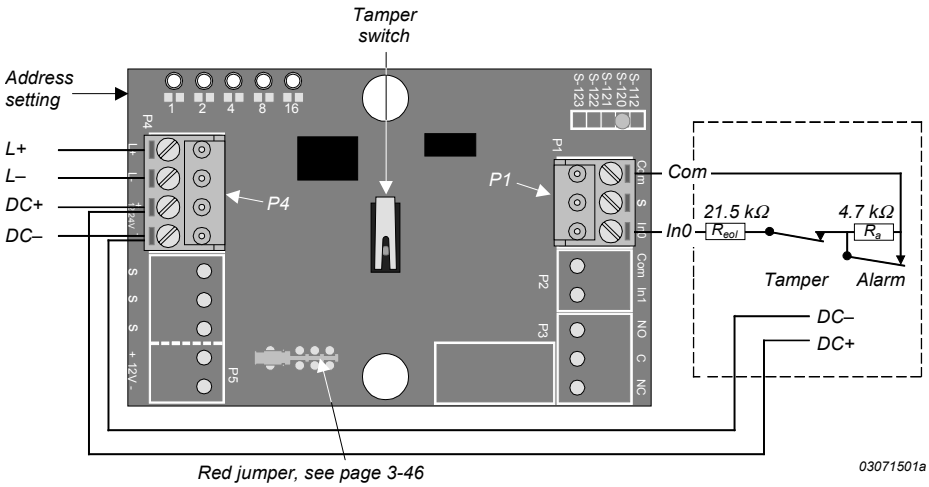
After connection, the jumper must be removed and placed in its original position. If not removed, the cover of the S-ART box cannot be properly fit.

3.8.10 Connection of S-ART Unit S-120

The S-120 is delivered with one resistor of 21.5 kΩ and one resistors of 4.7 kΩ that can be found inside the mounting box. Connect the resistors in the detector as shown in Fig. 3.54. Operating voltage (DC+ and DC–) for the detector is obtained from the of the S-ART bus.
More information about the S-120 can be found in Section 2.2.18.

Connection diagram

Fig. 3.54 *Example of connection of S-120.*



Connection

After mounting of the box and setting the address as explained in Section 3.8.16, insert the S-ART Unit board in the box and connect the detector and the S-ART bus as shown in Fig. 3.54 and listed in the connection table.

Connection table

The labelling of the terminals is placed next to the terminal connectors.

Conn.	*No.*	*Label*		*Description*
P4	1	"L+"		L+ of S-ART bus
	2	"L–"		L– of S-ART bus
	3	"12V/24V"	"+"	DC+ (Vdd) of S-ART bus. See also Section 3.7
	4		"–"	DC– (0 V) of S-ART bus. See also Section 3.7
P1	1	"In0"		Terminal for input loop 0.
	2	"S"		Loop terminal.
	3	"COM"		Terminal for input loop 0.

Input Line Extender

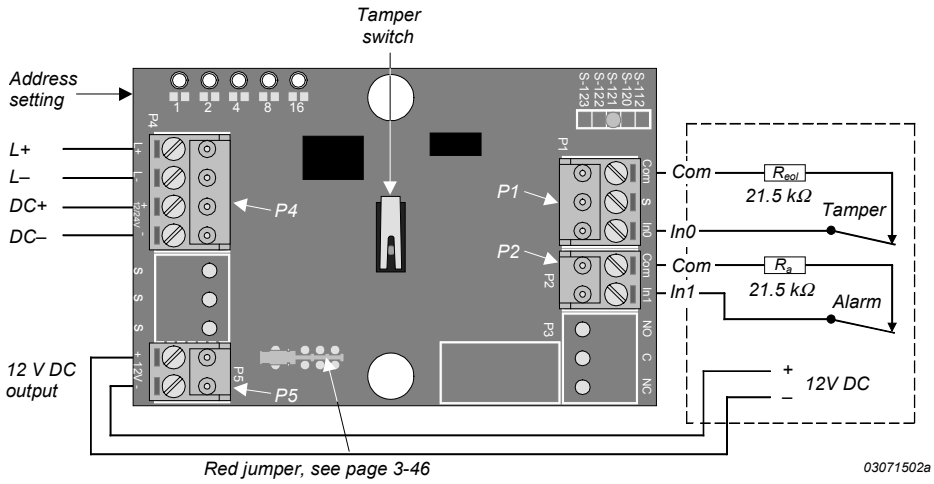
The Input Line Extender S-ILE enables the S-ART Unit S-120 to be used with cable lengths of up to 2000m between the detector and the S-ART Unit. See Section 3.8.15.

3.8.11 Connection of S-ART Unit S-121

The S-121 is delivered with two resistors of 21.5 kΩ that can be found inside the mounting box. Connect the resistors in the detector as shown in Fig. 3.43. Operating voltage for the detector is obtained from the 12 V DC output. More information about the S-121 can be found in Section 2.2.19.

Connection diagram

Fig. 3.55 *Example of connection of S-121.*



Connection

After mounting of the box and setting the address as explained in Section 3.8.16, insert the S-ART Unit board in the box and connect the detector and the S-ART bus as shown in Fig. 3.55 and listed in the connection table.

Connection table

The labelling of the terminals is placed next to the terminal connectors.

Conn.	*No.*	*Label*		*Description*
P4	**1**	"L+"		L+ of S-ART bus
	2	"L–"		L– of S-ART bus
	3	"12V/24V"	"+"	DC+ (Vdd) of S-ART bus. See also Section 3.7
	4		"–"	DC– (0 V) of S-ART bus. See also Section 3.7
P5	**4**	"12V"	"+"	12 V DC output.
	5		"-"	Ground for 12 V DC output.
P1	**1**	"In0"		Terminal for input loop 0 (Tamper).
	2	"S"		Loop terminal.
	3	"COM"		Terminal for input loop 0 (Tamper).
P2	**2**	"Com"		Terminal for input loop 1 (Alarm).
	1	"In1"		Terminal for input loop 1 (Alarm).

12 V DC power output

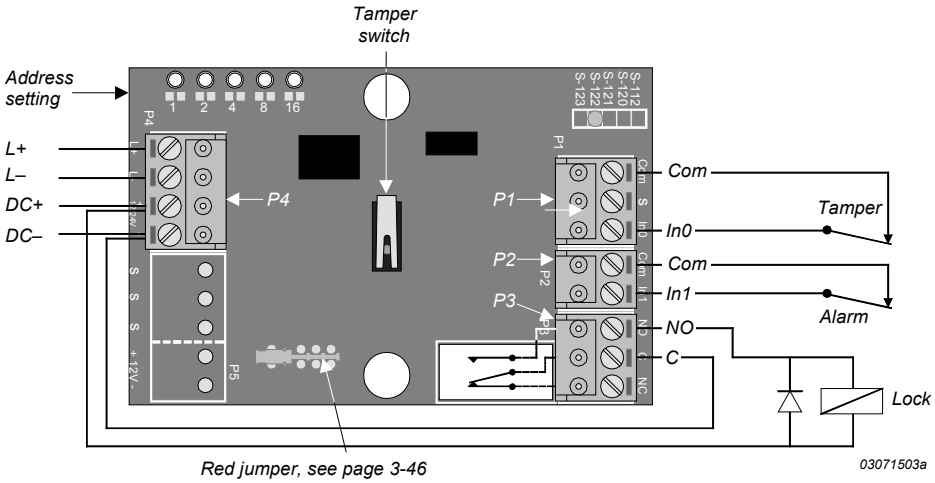
The output is used for powering a detector needing a 12V DC supply in case this cannot be operated from the DC+ (Vdd) and DC– (0 V) of the S-ART bus if this supply voltage (for example 24 V DC) exceeds the maximum operating voltage of the circuitry. An input voltage of at least 17.5 V DC (DC+, DC–) is required.

3.8.12 Connection of S-ART Unit S-122

The S-122 has a direct connection of tamper and alarm contacts needing no end of line resistors. Operating voltage (DC+ and DC–) for the device operated by the relay is obtained from the of the S-ART bus.
More information about the S-122 can be found in Section 2.2.20.

Connection diagram

Fig. 3.56 *Example of connection of S-122.*



Connection

After mounting of the box and setting the address as explained in Section 3.8.16, insert the S-ART Unit board in the box and connect the tamper and alarm switches and the device to be operated by the relay, and the S-ART bus as shown in Fig. 3.56 and listed in the connection table.

☛ If operating an inductive device such as an electrical lock via the relay, please remember to place a diode across the device as shown in Fig. 3.56.

Connection table

The labelling of the terminals is placed next to the terminal connectors.

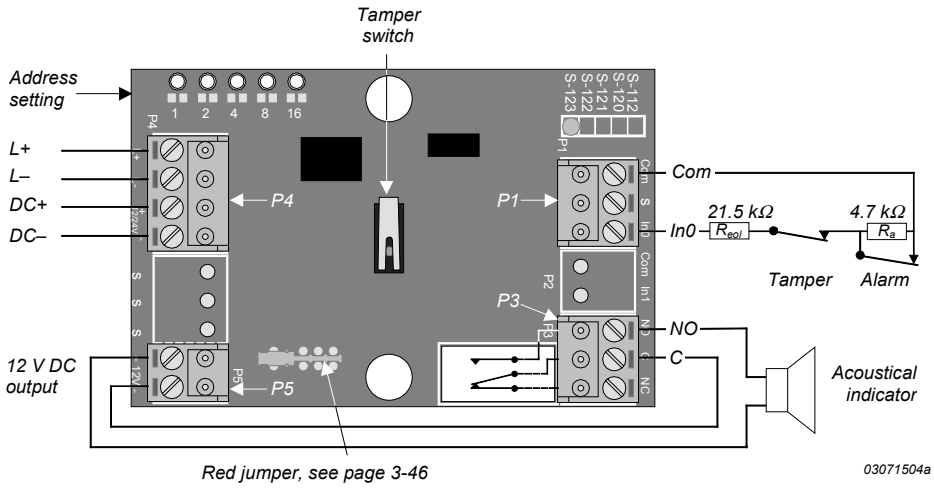
Conn.	*No.*	*Label*		*Description*
P4	**1**	"L+"		L+ of S-ART bus
	2	"L–"		L– of S-ART bus
	3	"12V/24V"	"+"	DC+ (Vdd) of S-ART bus. See also Section 3.7
	4		"–"	DC– (0 V) of S-ART bus. See also Section 3.7
P1	**1**	"In0"		Terminal for input loop 0 (Tamper).
	2	"S"		Loop terminal.
	3	"COM"		Terminal for input loop 0 (Tamper).
P2	**2**	"Com"		Terminal for input loop 1 (Alarm).
	1	"In1"		Terminal for input loop 1 (Alarm).
P3	**3**	"NO"		Relay, normally open contact
	2	"C"		Relay, common
	1	"NC"		Relay, normally closed contact (Not used in this application)

3.8.13 Connection of S-ART Unit S-123

The S-123 is delivered with one resistor of 21.5 kΩ and one resistors of 4.7 kΩ that can be found inside the mounting box. Connect the resistors in the detector as shown in Fig. 3.57. Operating voltage for the detector is obtained from the 12 V DC output.
More information about the S-123 can be found in Section 2.2.21.

Connection diagram

Fig. 3.57 *Example of connection of S-123.*



Connection

After mounting of the box and setting the address as explained in Section 3.8.16, insert the S-ART Unit board in the box and connect the detector and the S-ART bus as shown in Fig. 3.57 and listed in the connection table.

Connection table

The labelling of the terminals is placed next to the terminal connectors.

Conn.	*No.*	*Label*		*Description*
P4	**1**	"L+"		L+ of S-ART bus
	2	"L–"		L– of S-ART bus
	3	"12V/24V"	"+"	DC+ (Vdd) of S-ART bus. See also Section 3.7
	4		"–"	DC– (0 V) of S-ART bus. See also Section 3.7
P5	**4**	"12V"	"+"	12 V DC output.
	5		"-"	Ground for 12 V DC output.
P1	**1**	"In0"		Terminal for input loop 0 (Tamper).
	2	"S"		Loop terminal.
	3	"COM"		Terminal for input loop 0 (Tamper).
P3	**3**	"NO"		Relay, normally open contact
	2	"C"		Relay, common
	1	"NC"		Relay, normally closed contact (Not used in this application)

12 V DC power output

The output is used for powering a detector needing a 12V DC supply in case this cannot be operated from the DC+ (Vdd) and DC– (0 V) of the S-ART bus if this supply voltage (for example 24 V DC) exceeds the maximum operating voltage of the circuitry. An input voltage of at least 17.5 V DC (DC+, DC–) is required.

Input Line Extender

The Input Line Extender S-ILE enables the S-ART Unit S-123 to be used with cable lengths of up to 2000m between the detector and the S-ART Unit. See Section 3.8.15.

3.8.14 Installation of S-ART Unit S-130

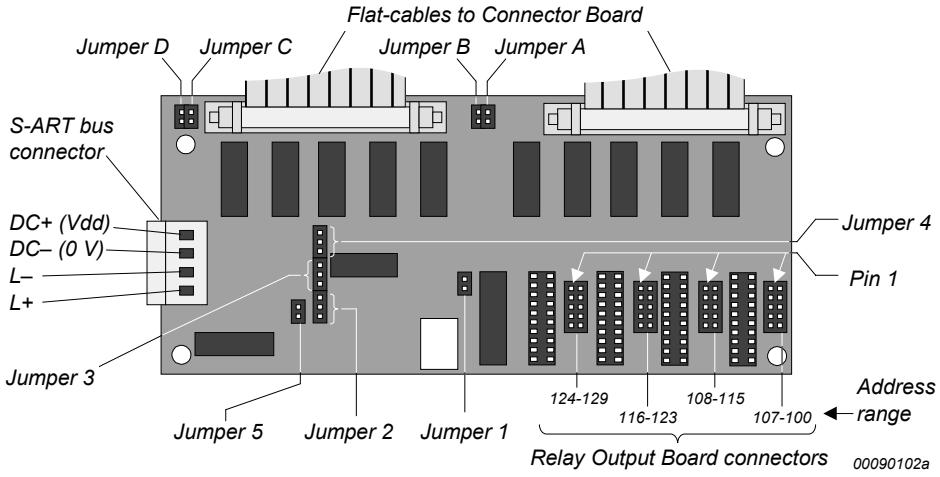
The S-130 comprises an S-ART Controller Board connected to the S-ART bus and a Connector Board for connection of the inputs. Relay Output Boards (Optional) are available for the outputs. Interconnections between the three types of units are performed by means of flat-cables.

The S-130 should be mounted in a box (not included) large enough to accommodate the Controller Board, the Connector Board and the number of Relay Output Boards required, leaving sufficient space for mounting the cables from the detectors. Measurements of the various units can be found in Section 2.2.22.

The mounting box can be equipped with a tamper switch that is connected to the tamper input of the Connector Board. See Fig. 3.59

Jumpers and connectors of Controller Board

Fig. 3.58 *Position of jumpers and connectors of S-ART Unit S-130 Controller Board.*



S-ART bus connections

The S-ART bus is connected to the S-ART bus connector together with the 12 V supply voltage (11 to 16 V DC). See Fig. 3.58.

Relay Output Board connectors

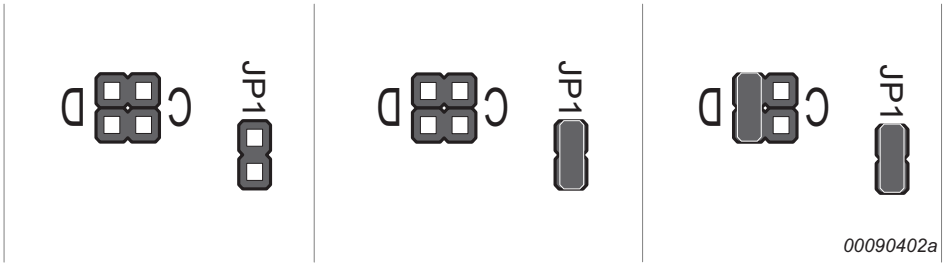
The address ranges for the Relay Output Board connectors are shown in Fig. 3.58 together with the position of pin 1 on the connectors. Pin 1 on the cable connectors is usually indicated by a mark.

Setting the address (jumpers “1” and “D”)

The jumpers “1” and “D” are used for setting the address range of the S-130. An S-ART bus can accommodate 30 addresses (00 to 29). This means that only one S-130 can be connected to the S-ART bus.
However, you can set the S-130 only to use either the address range 00 to 15 or 16 to 29 by the setting of jumper “1”. By means of jumper “D”, you can select which part of the addresses to use. With no jumper on “D”, the address range is set to 00 to 15; with a jumper installed, the address range is set 16 to 29.
See Fig. 3.58 for position of jumpers “1” and “D”.

Jumper setting for the various address settings *(See Fig. 3.58 for real position of jumpers)*

Full address range	Addresses 00 to 15	Addresses 16 to 29



Enabling/disabling anti-mask inputs (jumpers "A", "B", "C")

Jumpers "A" and "B" allows you to enable or disable the anti-mask inputs, while jumper "C" sets the polarity of the anti-mask. When delivered, jumpers "A" and "B" (and "C") are not fitted, meaning that the anti-mask inputs should not be used. See Fig. 3.58 for position of jumpers "A", "B", and "C".

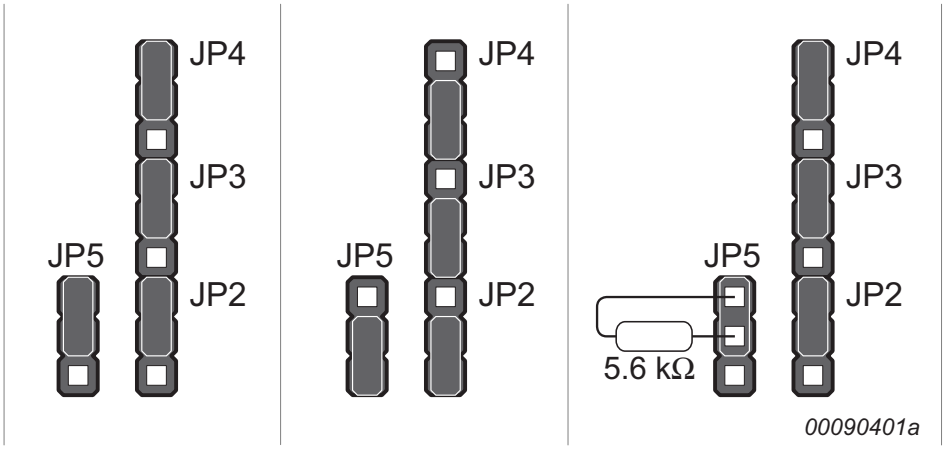
With jumper "A" installed, the triggering of an anti-mask input generates a sabotage message. With jumper "B" installed, the triggering of an alarm message. Only one of the jumpers must be installed.
The jumper "C" sets the polarity of the anti-mask inputs to use, either a normally closed (NC) contact when mounted or a normally open (NO) contact when removed.

End-of-line resistor (jumpers "2", "3", "4")

By means of the jumpers "2", "3", and "4", you can set the end-of-line resistor to 2.2 kΩ, 5.6 kΩ, or 10 kΩ. Please note that the value of 5.6 kΩ requires a 5.6 kΩ resistor mounted on "5" as shown below. See Fig. 3.58 for position of jumpers "2", "3", "4" and "5".

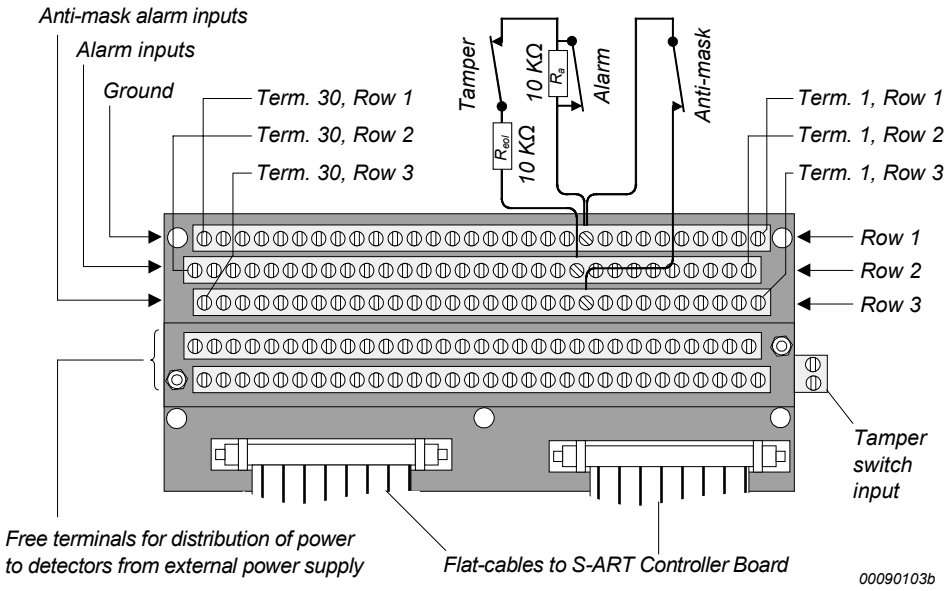
Jumper setting for the various end-of-line resistor values

2.2 kΩ	10 kΩ	5.6 kΩ



Terminals and connectors of Connector Board

Fig. 3.59 *Position of screw terminals and connectors of the S-ART Unit S-130 Connector Board with an example of connection of a detector to terminals 10 of Rows 1, 2, and 3.*



Alarm inputs

The alarm inputs from the detectors are connected to the alarm input terminals Row 2 and the common ground, Row 1 (See Fig. 3.59 and the following table).

Anti-mask inputs

The anti-mask inputs from the detectors are connected to the anti-mask inputs (Row 3 and the common ground, Row 1 (See Fig. 3.59 and the following table).

	Address	*Terminal*	*Address*	*Terminal*	*Address*	*Terminal*	*Address*	*Terminal*	*Address*	*Terminal*
Row 2	00	1	06	7	12	13	18	19	24	25
Row 3		1		7		13		19		25
Row 2	01	2	07	8	13	14	19	20	25	26
Row 3		2		8		14		20		26
Row 2	02	3	08	9	14	15	20	21	26	27
Row 3		3		9		15		21		27
Row 2	03	4	09	10	15	16	21	22	27	28
Row 3		4		10		16		22		28
Row 2	04	5	10	11	16	17	22	23	28	29
Row 3		5		11		17		23		29
Row 2	05	6	11	12	17	18	23	24	29	30
Row 3		6		12		18		24		30

Free terminals

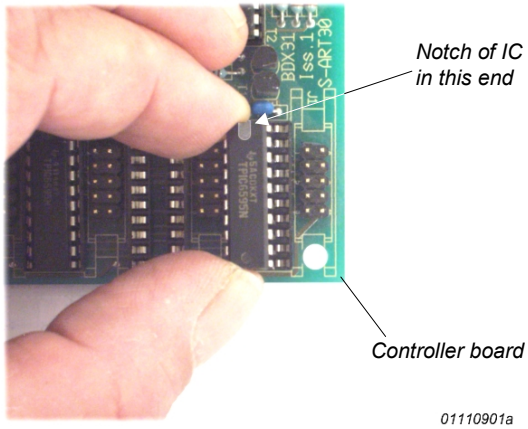
The two rows, each consisting of thirty terminals, can be used for distribution of power to detectors. The screw terminals of each row are interconnected so that you can use one row for positive supply voltage and one row for the negative supply voltage.

Tamper switch input

These terminals (See Fig. 3.59) are used for connection of a tamper switch to be placed in the box in which the S-130 is mounted. If no tamper switch is used, the terminals should be interconnected by a jumper.

Relay Output Board

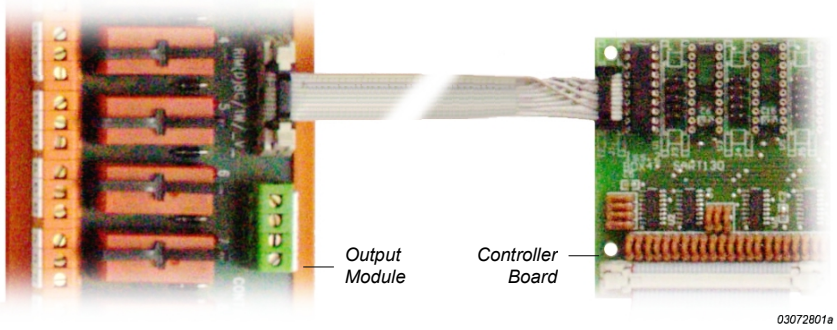
Up to four Relay Output Boards (Fig. 3.60) can be connected to the Controller Board by means of flat-cables. See Fig. 3.58 for position and address range of the connectors.



The Relay Output Board is delivered with a 50 cm long flat-cable for connection to the Controller Board and an output driver IC for insertion in one the IC-sockets next to output socket. Please observe the orientation of the IC when it is mounted as shown to the right.

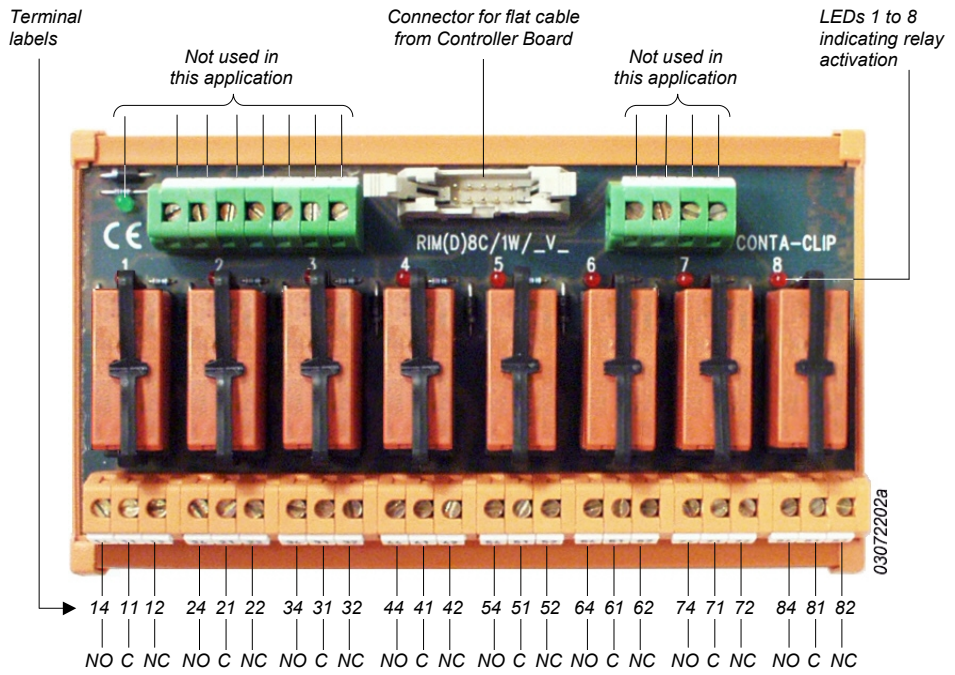
Interconnection of Controller Board and Relay Output Board

Fig. 3.60 *Example of the interconnection of the Controller Board and a Relay Output Board.*



Relay Output Board terminal location

Fig. 3.61 *Top view of a Relay Output Board showing position of connector and screw terminals.*



With reference to Fig. 3.61, the screw terminals of the Relay Output Board are used as follows:

Label	*Purpose*		*Label*	*Purpose*	
14	Relay 1	Normally open contact (NO)	54	Relay 5	Normally open contact (NO)
11		Common contact (C)	51		Common contact (C)
12		Normally closed contact (NO)	52		Normally closed contact (NO)
24	Relay 2	Normally open contact (NO)	64	Relay 6	Normally open contact (NO)
21		Common contact (C)	61		Common contact (C)
22		Normally closed contact (NO)	62		Normally closed contact (NO)
34	Relay 3	Normally open contact (NO)	74	Relay 7	Normally open contact (NO)
31		Common contact (C)	71		Common contact (C)
32		Normally closed contact (NO)	72		Normally closed contact (NO)
44	Relay 4	Normally open contact (NO)	84	Relay 8	Normally open contact (NO)
41		Common contact (C)	81		Common contact (C)
42		Normally closed contact (NO)	82		Normally closed contact (NO)

The terminals situated next to the flat-cable connector and labelled “-“, “+”, “-1”, “-2”, “-3”, “-4”, “-5”, “-6”, “-7”, and “-8” are not used in this application.

Indicator LEDs

Each relay is associated with a numbered indicator LED (“1” to “8”) situated next to relay. The LED (red) is switched on when the relay is activated. The green LED is not active in this application.

3.8.15 Installation of Input Line Extender S-ILE

The S-ART Input Line Extender kit, is available for the new S-ART Units types S120 and S123; i.e. the S-ART Units with a double balanced input.
The S-ART Input Line Extender kit increases the maximum allowed cable length between the S-ART Unit and the detector / contact from 100 meters to 2000 meters.

The S-ART Input Line Extender kit consists of:

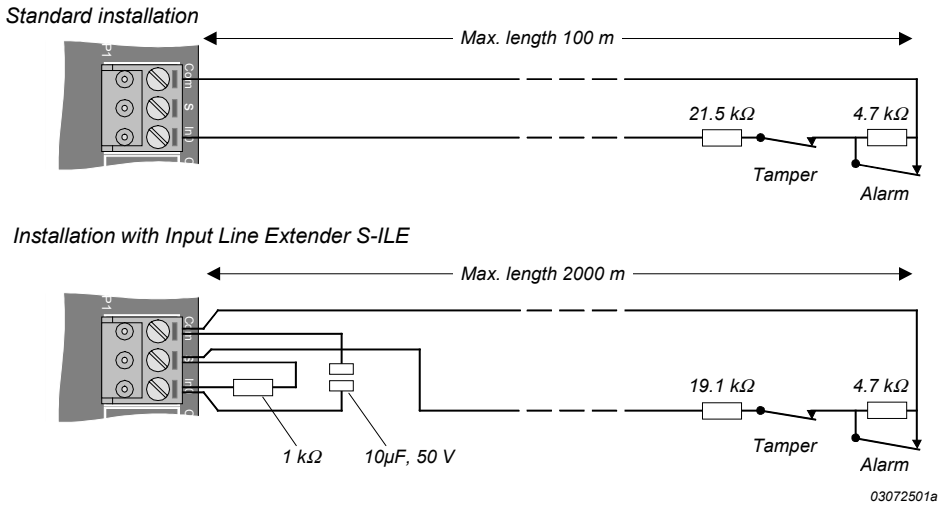
One 19.1 kΩ ±1% resistor (Colour code: Brown, white, brown, red, brown)

One 1 kΩ ±1% resistor (Colour code: Brown, black, black, brown, brown, red)

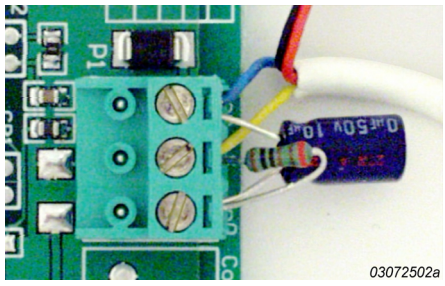
One 10 µF/50 V bipolar capacitor.

The standard resistors supplied with S-ART Units type S120 and S123 are a 4.7 kΩ ±1% resistor (Alarm) with the colour code: Yellow, violet, black, brown, brown and a 21.5 kΩ ±1% resistor (Line) with the colour code: Red, brown, green, red, brown. The latter resistor (21.5 kΩ) is substituted by the two resistors (19.1 kΩ and 1 kΩ) as shown in Fig. 3.62.

Fig. 3.62 *Standard installation (Max. 100 m cable length) and installation with the Input Line Extender kit (Max. 2000 m cable length) with the S-Art Units Types S-120 and S-123.*



Example of the mounting of the 1 kΩ and the 10 µF/50 V bipolar capacitor of the S-ART Input Line Extender kit on the terminal block “P1” of the S-ART Unit.
The 19.1 kΩ resistor of the S-ART Input Line Extender kit is placed in series with the tamper switch of the detector.



3.8.16 Coding of S-ART addresses

When installing S-ART Units, the address coding jumpers of each S-ART Unit must be coded with an address.

S-106, S-107, S-108, and S-130

For the S-ART Units S-106, S-107, S-108 and S-130, the setting or coding of the address is described in the sections dealing with the mounting and installation of these S-ART Units.

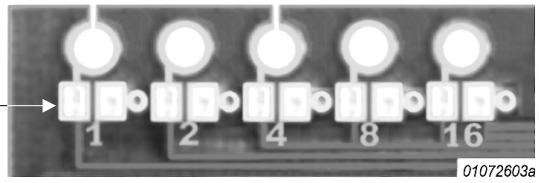
S-112, S-120, S-121, and S-122, S-123

The address of an S-112, S-120, S-121, S-122, or S-123 is set by cutting of jumpers. The jumpers are formed as holes near the edge of the circuit board and are cut by means of a pair of *small* side-cutters. The holes are labelled “1”, “2”, “4”, “8”, and “16”. The table below shows which jumpers to cut to achieve a certain address.

	Hole number						Hole number						Hole number				
Address	**1**	**2**	**4**	**8**	**16**	**Address**	**1**	**2**	**4**	**8**	**16**	**Address**	**1**	**2**	**4**	**8**	**16**
00	O	O	O	O	O	10	O	∪	O	∪	O	20	O	O	∪	O	∪
01	∪	O	O	O	O	11	∪	∪	O	∪	O	21	∪	O	∪	O	∪
02	O	∪	O	O	O	12	O	O	∪	∪	O	22	O	∪	∪	O	∪
03	∪	∪	O	O	O	13	∪	O	∪	∪	O	23	∪	∪	∪	O	∪
04	O	O	∪	O	O	14	O	∪	∪	∪	O	24	O	O	O	∪	∪
05	∪	O	∪	O	O	15	∪	∪	∪	∪	O	25	∪	O	O	∪	∪
06	O	∪	∪	O	O	16	O	O	O	O	∪	26	O	∪	O	∪	∪
07	∪	∪	∪	O	O	17	∪	O	O	O	∪	27	∪	∪	O	∪	∪
08	O	O	O	∪	O	18	O	∪	O	O	∪	28	O	O	∪	∪	∪
09	∪	O	O	∪	O	19	∪	∪	O	O	∪	29	∪	O	∪	∪	∪

∪ = Cut O = Uncut

In the example to the right, the jumpers “1” and “4” have been cut while the jumpers “2”, “8” and “16” are uncut thereby fixing the address to 05.



5 x 2 soldering pads

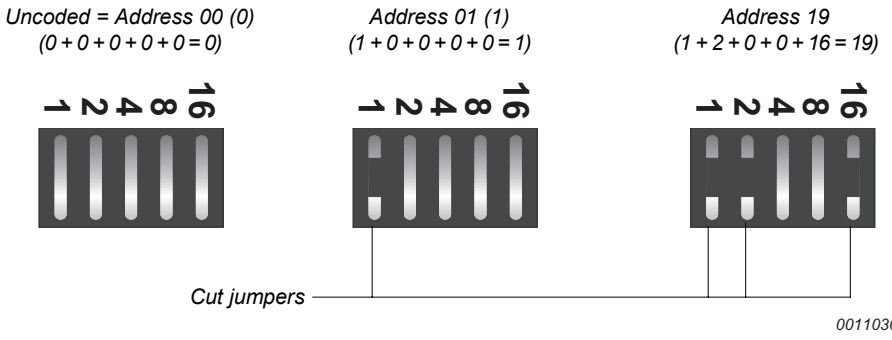
The soldering pads just above the numbers can be used for soldering a small piece of wire across a cut jumper to reestablish a connection if an error has been made during the setting of the address.

S-100, S-101, S-102, and S-103

For the S-ART Units S-100, S-101, S-102, and S-103, the setting or coding of the address is performed by cutting of jumpers.
Five small jumpers are available on each S-ART board labelled “1”, “2”, “4”, “8” and “16”. Each jumper adds the value numbered to the address when it is cut. An S-ART Unit with no jumpers cut will have the address 00.

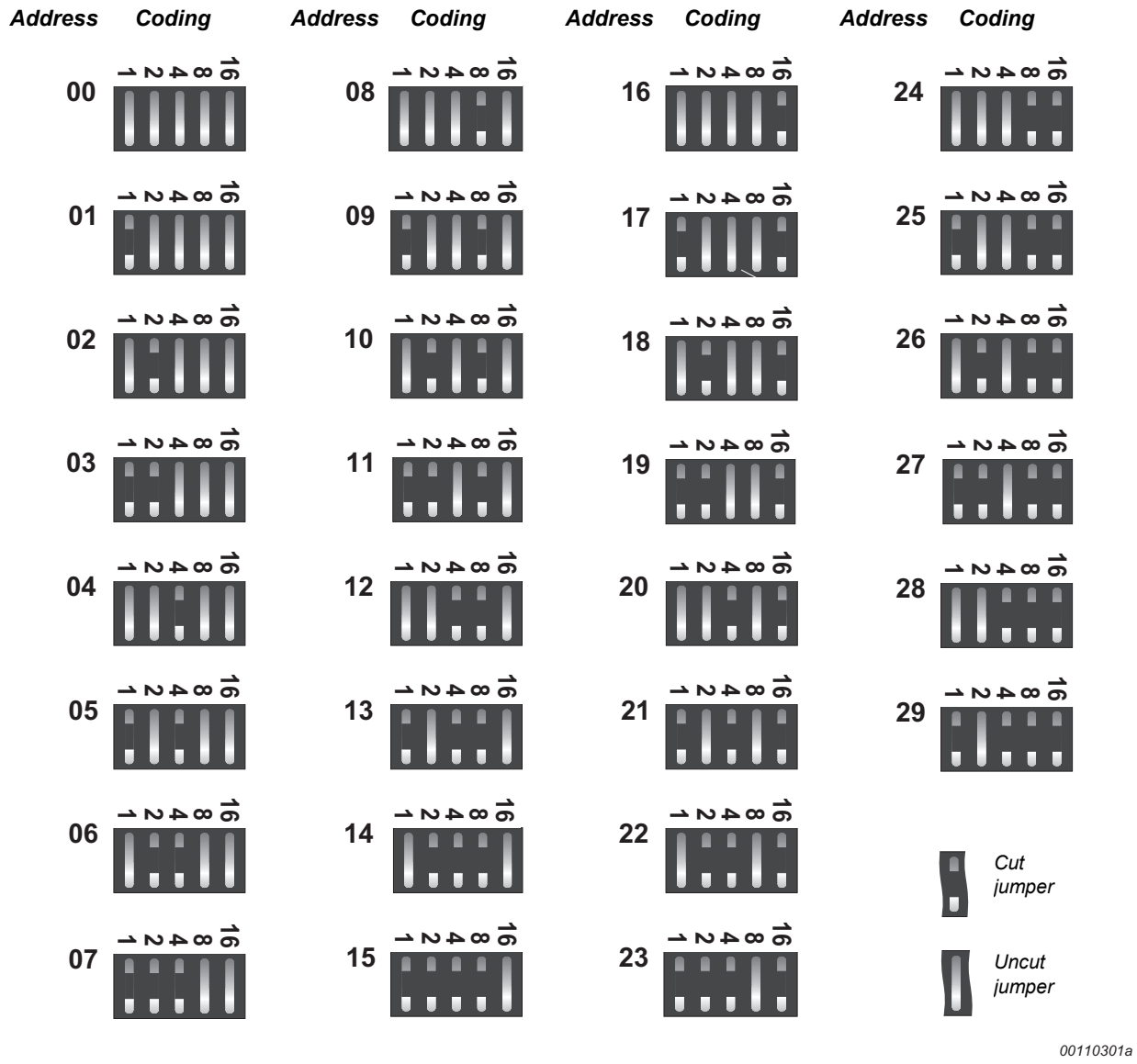
The jumper to be cut depends on the address. The address is coded in binary numbers, for instance address 19 can be written as 10011 => 16 = 1, 8 = 0, 4 = 0, 2 = 1, and 1 = 1. If this address is to be coded the jumpers marked “16”, “2” and “1” must be cut.

Fig. 3.63 *Examples of address settings.*



The table applies to the S-ART Units S-100, S-101, -102 and S-103.

Fig. 3.64 *Jumpers to cut for setting the address of S-ART Units S-100, S-101, S-102 and S-103.*



3.9 Cable length and dimension

When installing acoustical and optical warning devices, Intruder Alarm Keypad and S-ART Units, cable length and current consumption must be taken into account when selecting the cable dimension.

For the RS-485 bus, shielded cable with twisted pair is recommended. The total length should not exceed 1200 m, and the supply voltage (Vdd) at the end of the line should not drop below 10 V. All devices on this line must be connected as shown in Fig. 3.30 - "star-connections" exceeding 0.3 m in length are not allowed.

For the S-ART lines, unshielded cable with twisted pair is recommended. The total length including "star-connections" should not exceed 1000 m. The line voltage at the far end should not drop below 12 V (normally 17 V). The minimum supply voltage accepted depends on detector types etc.

The voltage drop of a two-wire cable (both conductors included) may be calculated from:

Ua = (Rd x Idc x L) : 500, where

Ua = Voltage drop in volt.

Rd = Wire resistance in Ω/m.

Idc = Current consumption in mA.

L = Cable length in metres.

Resistance of a 0.6 mm diameter (0.25 mm²) cable is Rd = 6.15 Ω/100m.

Resistance of a 1.0 mm diameter (0.75 mm²) cable is Rd = 2.32 Ω/100m.

Resistance of a 1.4 mm diameter (1.50 mm²) cable is Rd = 1.16 Ω/100m.

Resistance of a 1.8 mm diameter (2.50 mm²) cable is Rd = 0.69 Ω/100m.

3.10 Current consumption

The table below lists typical current consumption at nominal voltages of 12 V (Vdd) and 24 V (Vdd) for the various units of a ThorGuard Intruder Alarm System. All values provided are for one S-ART Unit, one Intruder Alarm Keypad, etc. The values for the different S-ART Units do not include load on the outputs.

Equipment	*Normal*	*Alarm*
Intruder Alarm Keypad. With backlight on, add 60 mA	60 mA at 24 V and 12 V	60 mA at 24 V and 12 V
ThorGuard S-ART 120 Expansion Board.	50 mA at 12 V 40 mA at 24 V	50 mA at 12 V 40 mA at 24 V
External Display Module. With backlight on, add 60 mA	20 mA at 24 V 30 mA at 12 V	20 mA at 24 V 30 mA at 12 V
S-100	0 mA at 12V/24 V 2 mA at 17 V (S-ART line)	0 mA at 12V/24 V 2 mA at 17 V (S-ART line)
S-101	0 mA at 12V/24 V 2 mA at 17 V (S-ART line)	0 mA at 12V/24 V 2 mA at 17 V (S-ART line)
S-102	0 mA at 12V/24 V 2 mA at 17 V (S-ART line)	0 mA at 12V/24 V, 12 mA with relay activated 2 mA at 17 V (S-ART line)
S-103	0 mA at 12V/24 V 2 mA at 17 V (S-ART line)	0 mA at 12V/24 V, 12 mA with relay activated 2 mA at 17 V (S-ART line)
S-106	0 mA at 12V/24 V 12 mA at 17 V (S-ART line)	0 mA at 12V/24 V 12 mA at 17 V (S-ART line)
S-107	0 mA at 12V/24 V 2 mA at 17 V (S-ART line)	0 mA at 12V/24 V 2 mA at 17 V (S-ART line)
S-108	0 mA at 12V/24 V 0.8 mA at 17 V (S-ART line)	0 mA at 12V/24 V 0.8 mA at 17 V (S-ART line)
S-112	4 mA at 12V/24 V 3 mA at 17 V (S-ART line)	20 mA at 12V and 35 mA at 24 V with relay activated. 3 mA at 17 V (S-ART line)
S-120	0 mA at 12V/24 V 3 mA at 17 V (S-ART line)	0 mA at 12V/24 V 3 mA at 17 V (S-ART line)
S-121	4 mA at 12V/24 V 3 mA at 17 V (S-ART line)	4 mA at 12V/24 V 3 mA at 17 V (S-ART line)
S-122	0 mA at 12V/24 V 3 mA at 17 V (S-ART line)	20 mA at 12V and 35 mA at 24 V with relay activated. 3 mA at 17 V (S-ART line)
S-123	4 mA at 12V/24 V 3 mA at 17 V (S-ART line)	20 mA at 12V and 35 mA at 24 V with relay activated. 3 mA at 17 V (S-ART line)
S130	25 mA at 13.6 V	25 mA at 13.6 V

The listed values are useful not only for calculating cable length and dimension, but also for calculating the total power consumption and the battery capacity needed. During log-on to an Intruder Alarm Keypad etc., the current will increase with typically 60 mA due to the backlight and status lamps.

For the calculation of the battery capacity needed, the S-ART Unit consumption is the total of the consumption at 24 V/12 V (Vdd) and at 17 V (S-ART line) plus the plus load on the 12 VDC outputs for the S-ART Units S-101, S-103, S-112, S-121, and S-123.

4

Transfer of firmware files

Introduction

This chapter provides the information needed by installers to transfer the firmware files to the Thor Guard Central Unit when an update of the currently installed firmware is needed.

This chapter

The chapter contains the following sections:

4.1 Introduction

Introduction

This section describes how to connect the ThorGuard Central Unit to the PC to use for transfer of the firmware files (programming of firmware) to the ThorGuard Central Unit.
Before you start, check that the PC – stationary or portable – fulfils at least the requirements below.

4.1.1 PC requirements

The PC to use for the transfer of the firmware of the ThorGuard Central Unit, must at least fulfill the following requirements:

- PC with Pentium I processor with at least 100 MHz clock frequency.
- At least 64 Mbyte RAM.
- At least 8 Mbyte free hard disk space.
- Super VGA display (1024 x 768 pixels) and 16 bit colours.
- One 3½ " floppy disk drive.
- One free COM port for connection to the ThorGuard Central Unit.
- Two-button mouse.
- Windows 2000®, Windows NT® (4.0), or Windows XP® installed and running well.

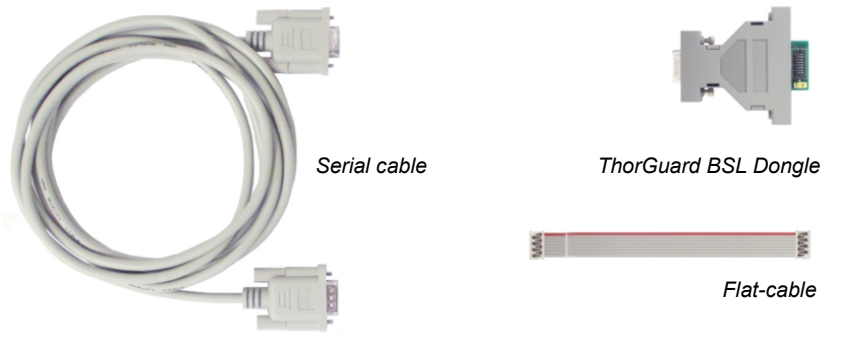
☛ Please note that if you also want to use the PC for configuring the system, the PC must have at least a Pentium III processor with 450 MHz clock frequency, 120 Mbyte free hard disk space, at least 128 Mbyte RAM and a CD-ROM drive.

4.1.2 Accessories required

In addition to the PC, a ThorGuard BSL Dongle is required. This comprises:

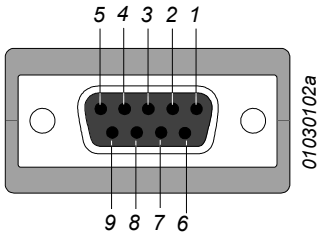
- One ThorGuard BSL Dongle.
- One 0.5 m long, 8-lead flat cable terminated with connectors.
- One 3 m long serial cable terminated with 9-pole D-connectors.
- One 3½ " floppy disk with the files for the Boot Strap Loader that controls the download.

Fig. 4.1 *ThorGuard BSL Dongle with accessories included (Except the 3½ " floppy disk).*



Terminals of BSL Dongle female D-connector

No.	*Description*
1	Not connected
2	TxD
3	RxD
4	Not connected
5	Ground
6	Not connected
7	Not connected
8	Not connected
9	Not connected



4.1.3 Prerequisites

The instructions for transfer of the firmware for the ThorGuard Central Unit assumes that you have performed the following tasks in the sequence listed below.

1 The ThorGuard Boot Strap Loader installed on the PC (Section 4.2) and set up as described in Section 4.4.

2 The ThorGuard Central Unit and the PC to be used for the transfer of the firmware files interconnected (Fig. 4.3 and Fig. 4.4) by means of the items listed above.

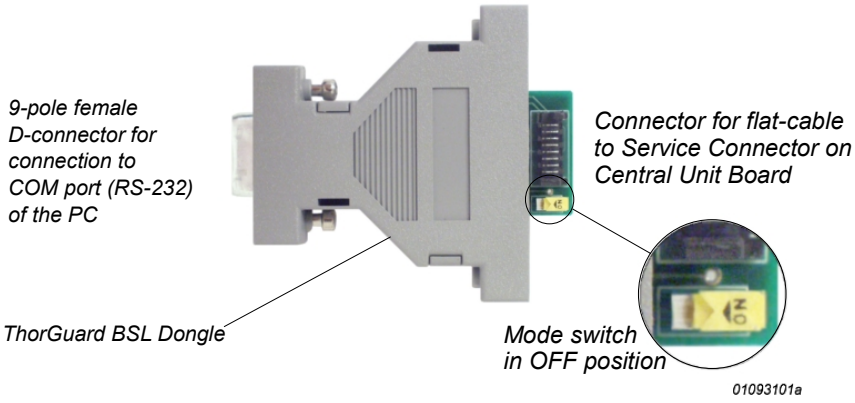
3 The Mode switch of the ThorGuard BSL Dongle (Version 1 only) set to OFF (Fig. 4.2). Later versions are not equipped with a mode switch.

4 The PC switched on and the ThorGuard Boot Strap Loader started.

5 Just prior to the transfer of the firmware , press the Reset switch (See Fig. 4.3)

Setting of mode switch

Fig. 4.2 *Connectors and mode switch of the ThorGuard BSL Dongle, version 1. Later versions are not equipped with a mode switch.*

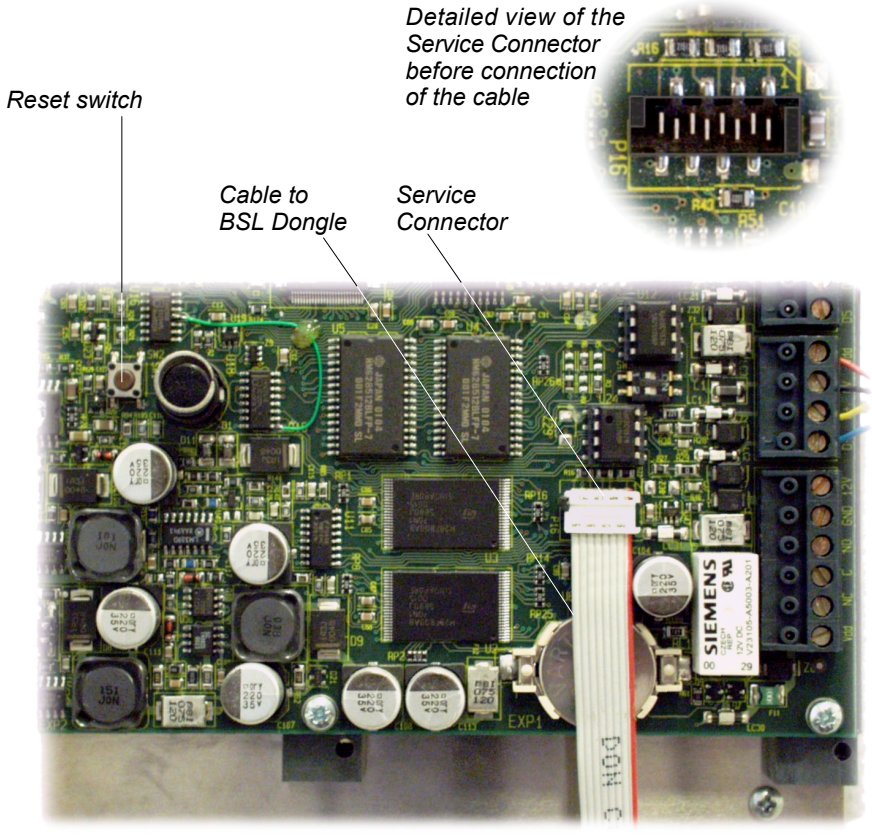


When you have set the Mode switch to off (Version 1 only), connect the flat-cable to the Service Connector as shown in Fig. 4.3. Then connect the other end of the flat-cable to the flat-cable connector of the ThorGuard BSL Dongle and the male end of the serial cable to the D-connector of the BSL Dongle (Fig. 4.4). The Service Connector and the connector on the BSL Dongle are both equipped with studs so that the plugs of the flat-cable cannot be wrongly mounted.

Locate a free COM port on the PC and insert the female end of the serial cable in the connector (Fig. 4.4).

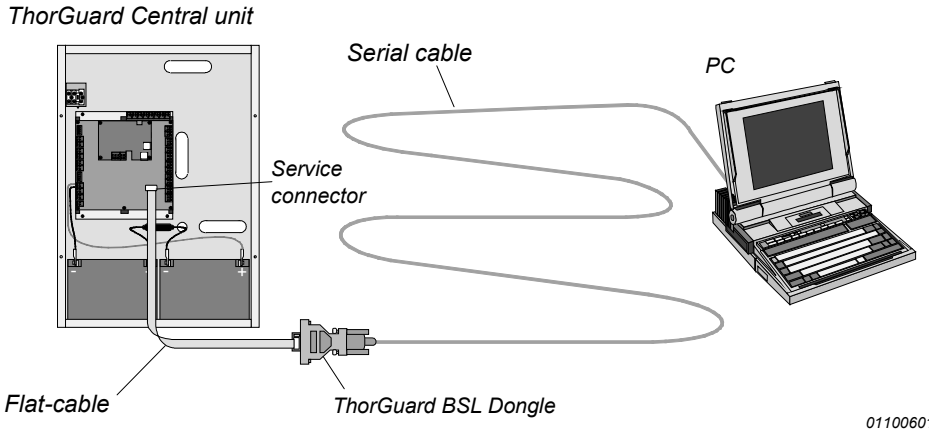
Position of Service Connector and Reset switch

Fig. 4.3 *Position of Service Connector and Reset switch.*



Connection of PC

Fig. 4.4 *Connection of the Thor Guard Central Unit with the PC for transfer of firmware files.*



4.2 Installing the Boot Strap Loader

Introduction

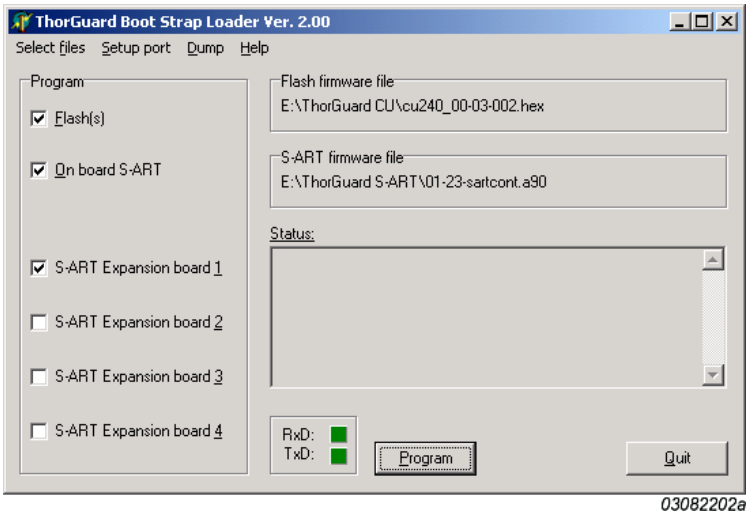
Before you can perform the transfer of firmware files, the ThorGuard Boot Strap Loader that controls the transfer of the files must be installed.

Installing the Boot Strap Loader files

The Boot Strap Loader files are contained on the 3½ “ floppy disk delivered with the ThorGuard BSL Dongle. To install and start the ThorGuard Boot Strap Loader follow the instructions below:

Step	*What to do …*
1	Make a new directory on your hard disk drive of the PC to use for download, for example with the name “ThorGuard BSL”.
2	Insert the 3½ “ floppy disk delivered with the ThorGuard BSL Dongle in the diskette drive of the PC to use for the transfer of firmware files.
3	Copy the files BSL.exe, BSLStage1.hex, BSLStage2.hex, and BSLStage3.hex from the diskette to the “ThorGuard BSL” directory.
4	Double-click the BSL.exe of the “ThorGuard BSL” directory to start the “ThorGuard Boot Strap Loader”.
6	Go to Section 4.3, 4.4, and 4.5 that explain how to set up the program and how to transfer the firmware files.

Fig. 4.5 *Example of the ThorGuard Boot Strap Loader program window.*

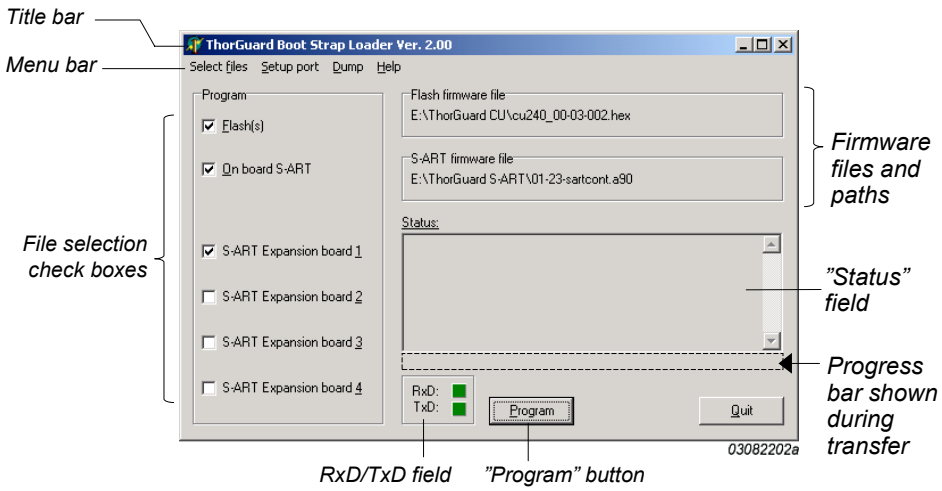


4.3 The Boot Strap Loader program window

Introduction

The program window of the ThorGuard Boot Strap Loader contains fields for showing the currently selected firmware files to transfer and a number check boxes for selecting the firmware files that should be transferred.
In addition to this, a status field and a progress bar show the progress of the transfer process. An indicator field shows the transfer of data to and from the ThorGuard Central Unit

Fig. 4.6 *Example of the ThorGuard Boot Strap Loader program window.*



Titlebar

The titlebar shows the name of the program and its version

Menubar

The menubar has four items, “Select files” for selecting the firmware files to transfer (See Section 4.4), “Setup port” for selecting the COM port of the PC and the baud rate to use for the download (See Section 4.4), “Dump” for transferring the contents of a FLASH memory or an S-ART controller to a file on your harddisk, and “Help”.

Firmware files

The firmware file boxes displays the currently selected paths and files to use for the programming of the firmware.

File selection check boxes

By means of the file selection check boxes, you can select the files to transfer. You can select to transfer files for a single item, for more items or for all items as required (See Section 4.5).

“Program” button

When you have selected the firmware files to transfer, click the “Program” button to start the transfer (programming of firmware).

“Status” field

The progress of the transfer can be followed in the “Status” field that list the task performed and on the progress bar just below the “Status” field. See the example of Fig. 4.12.

RxD/TxD field

The RxD/TxD field contains two indicators that indicate the data traffic on the TxD and RxD terminals by shifting between green and red. The actual process carried out is indicated in the “Status” field.

4.4 Set up of the Boot Strap Loader

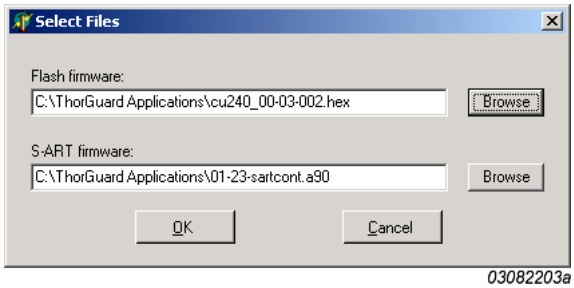
Introduction

Before the Boot Strap Loader can be used, a set up comprising a selection of the firmware files and a selection of COM port to use and the baud rate to use.

File selection

To select the file, click the “Select File” menu item. This displays the “Select files” dialog below. Click the “Browse” button next to the “Main firmware” box to display a “Select File” dialog (Not shown) in which you can locate the main firmware file to use. Repeat this for the “S-ART firmware” box. Then click the “OK” button when all paths have been selected.

Fig. 4.7 *Example of the “Select files” dialog.*



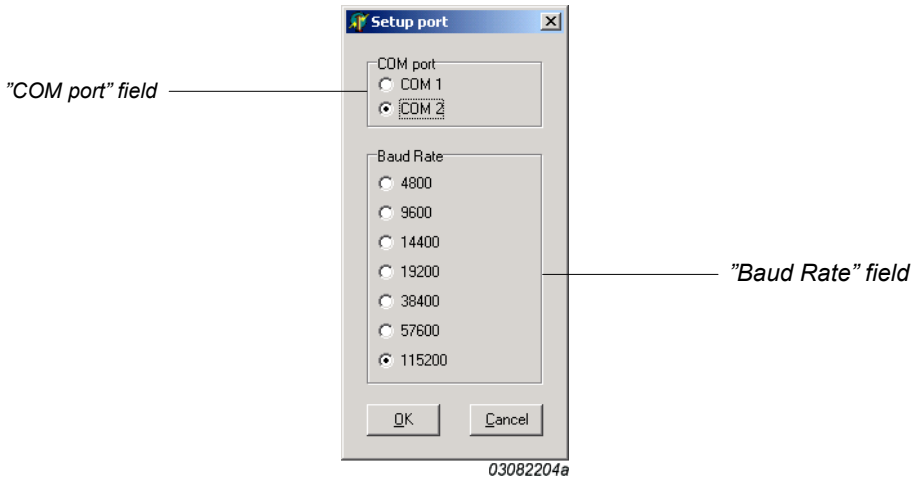
Serial Port selection

The serial port and the baud rate are set by clicking the “Serial Port” menu item. This displays the “Setup COM port” dialog below.
In the “COM port” field, click the option button for the COM port you are using (“COM1” or “COM2”).

In the “Baud Rate” field, click the option button for the baud rate you want to use. You should select the maximum baud rate that your COM port can handle.

The click the “OK” button when you have made the required selections.

Fig. 4.8 *Example of the “Setup COM port” dialog.*

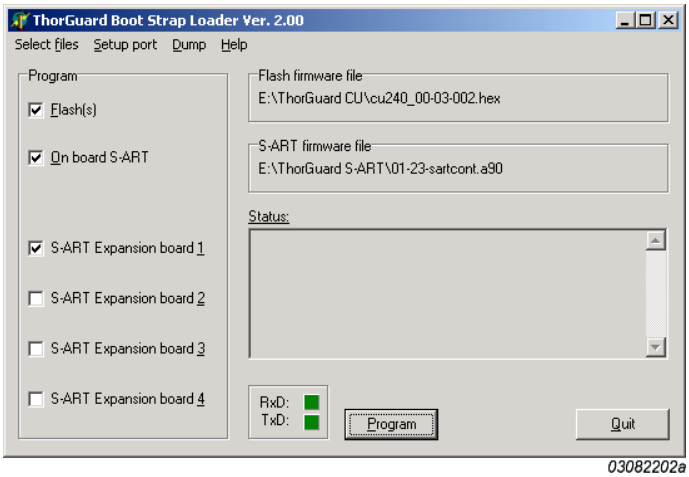


4.5 Transfer of firmware files

Introduction

The selection of the files to be transferred is performed by means of the check boxes in the “Program” field as described below.

Fig. 4.9 *Example of the program window with transfer selected of firmware files for the FLASH memories, the on-board S-ART Controller and the S-ART 120 Expansion Board in slot No. 1(Fig. 4.10).*



“Program” field

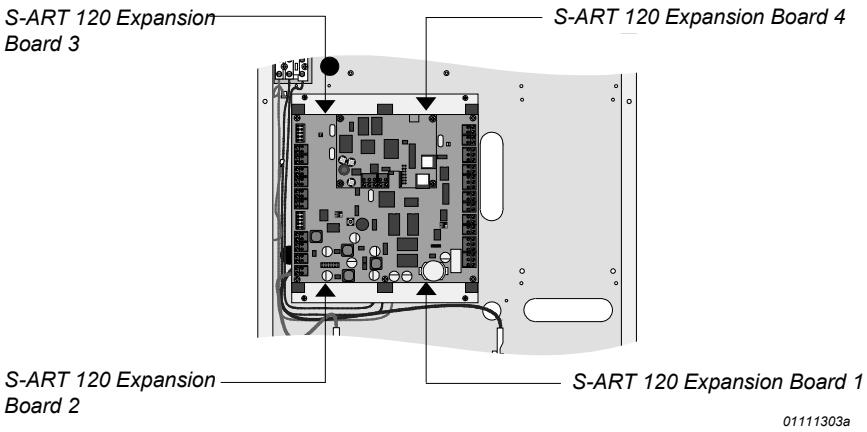
In the “Program” field (See Fig. 4.6), you can select the firmware files to transfer by checking the appropriate check boxes. The following choices are available:

Check box label	***Description***
“Flash(s)”	Selects transfer of firmware files for the FLASH 1 and FLASH 2 memories.
”On-board S-ART”	Selects transfer of firmware files for the on-board S-ART Controller.
“S-ART expansion board 1	Selects transfer of firmware files for the S-ART 120 Expansion Board in slot No.1.
“S-ART expansion board 2	Selects transfer of firmware files for the S-ART 120 Expansion Board in slot No.2.
“S-ART expansion board 3	Selects transfer of firmware files for the S-ART 120 Expansion Board in slot No.3.
“S-ART expansion board 4	Selects transfer of firmware files for the S-ART 120 Expansion Board in slot No.4.

See Fig. 4.10 on the following page for position of S-ART Expansion Boards.

Position of S-ART 120 Expansion Boards

Fig. 4.10 *The position and number of the S-ART 120 Expansion Boards.*



Reset switch

After you have selected what to transfer, press the Reset switch on the CPU-board (See Fig. 4.3 for location of the Reset switch).

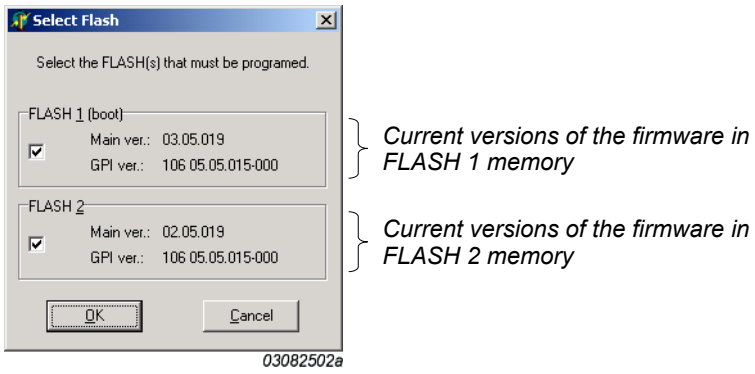
“Program” button

Then click the “Program” button to perform the transfer of firmware files. If you have selected only transfer of firmware files to the on-board S-ART Controller and/or S-ART 120 Expansion Board(s), transfer will start immediately (Fig. 4.12).

“Select Flash” dialog

If you have selected transfer of firmware files to the FLASH memories, The “Select Flash” dialog will be displayed. In this dialog you can select the memory to which you want to transfer firmware file.
The dialog displays the current version of the firmware contained in the two FLASH memories.

Fig. 4.11 *Example of the “Select Flash” dialog.*



☛ Before you select which FLASH to transfer firmware files to, check the version of the CPU-board. Information about identification can be found in Fig. 3.7 on page 3-11.

Version 1.0 or 1.1

If you are about to transfer firmware files to a CPU-board version 1.0 or 1.1, you should select transfer to both FLASH 1 and FLASH 2.

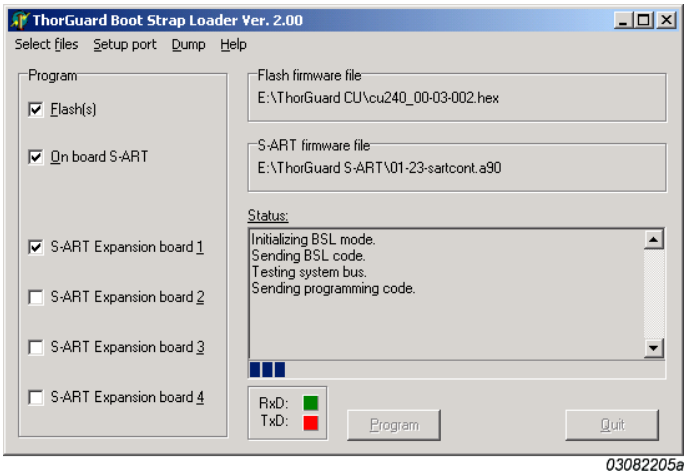
Version 2.0

If you are about to transfer firmware files to a CPU-board version 2.0, you can freely select which FLASH memory to transfer to or transfer to botm FLASH memories.

When you have made you selection, click the “OK” button of the dialog. This will start the transfer of firmware files

The progress of the transfer can be followed in the “Status” field that lists the task performed and on the progress bar just below the “Status” field (See Fig. 4.12).

Fig. 4.12 *Example of the program window during the transfer selected of firmware files. The transfer of the files has just started.*

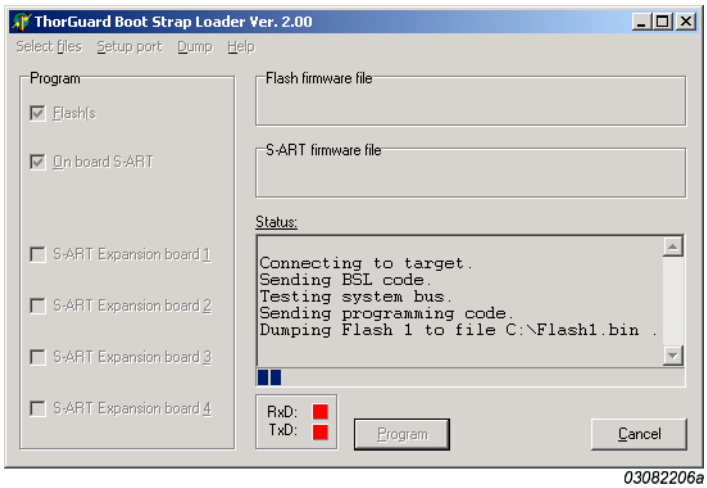


When the transfer has been completed without error messages in the “Status” field, the text “Transfer completed successfully” is shown in the “Status” field.

4.6 Dump of firmware files

If you want to save a copy of the firmware contained in the ThorGuard Central Unit, you can use the commands of the “Dump” menu.

Fig. 4.13 *Example of the program window showing a dump of firmware of the FLASH 1memory.*



When the wanted FLASH memory or an S-ART controller has been selected in the “Dump” menu, the contents is transferred to a file on your harddisk. The table below shows the path and file to which the contents is transferred:

Menu command	***File path and name***
“Flash 1”	C:\Flash1.BIN
“Flash 2”	C:\Flash2.BIN
“On-board S-ART”	C:\SART0.BIN
“S-ART exp. 1”	C:\SART1.BIN
“S-ART exp. 2”	C:\SART2.BIN
“S-ART exp. 3”	C:\SART3.BIN
“S-ART exp. 4”	C:\SART4.BIN

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